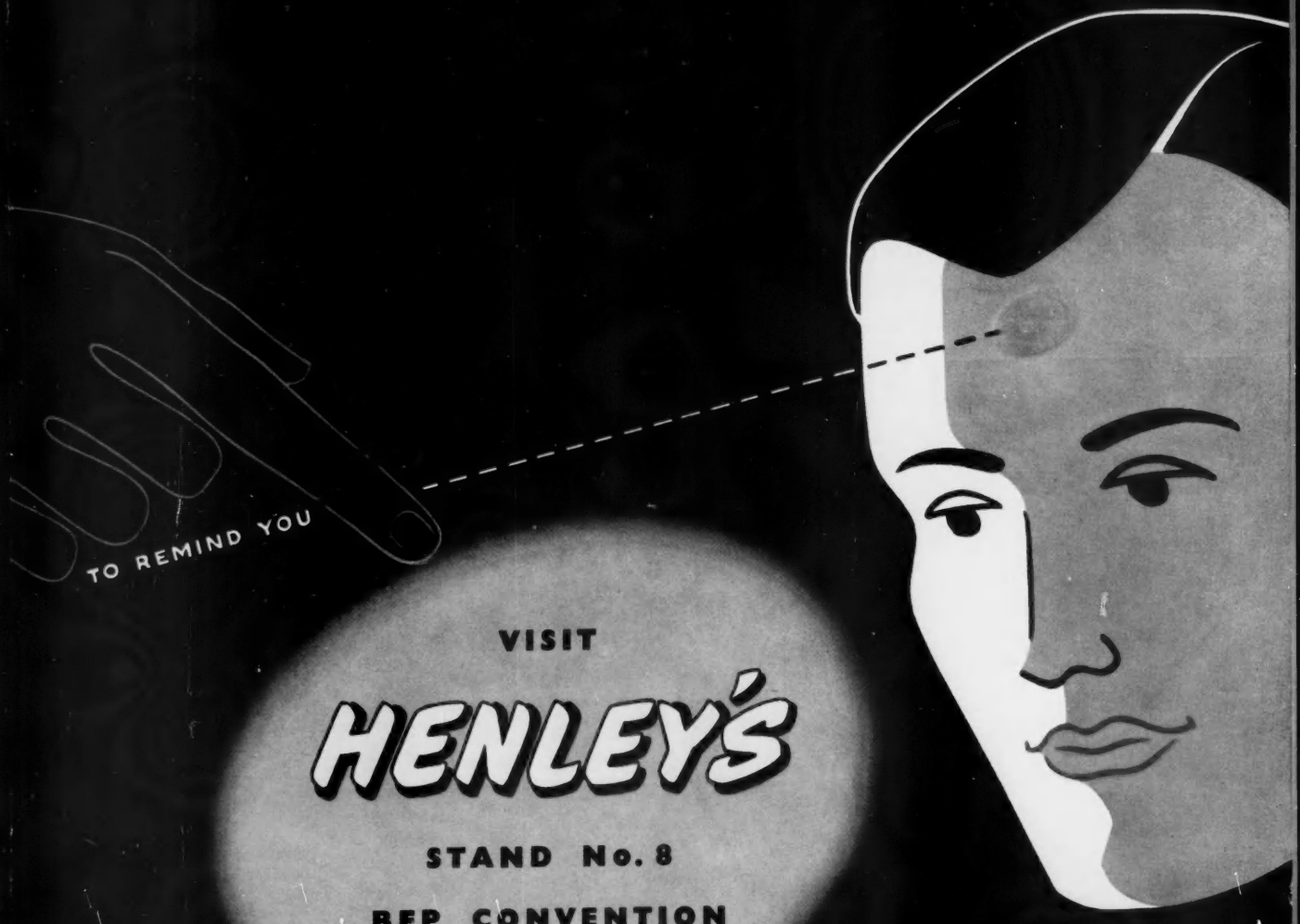
10 JUNE 1954

NINEPENCE

ELECTRICAL TIMES



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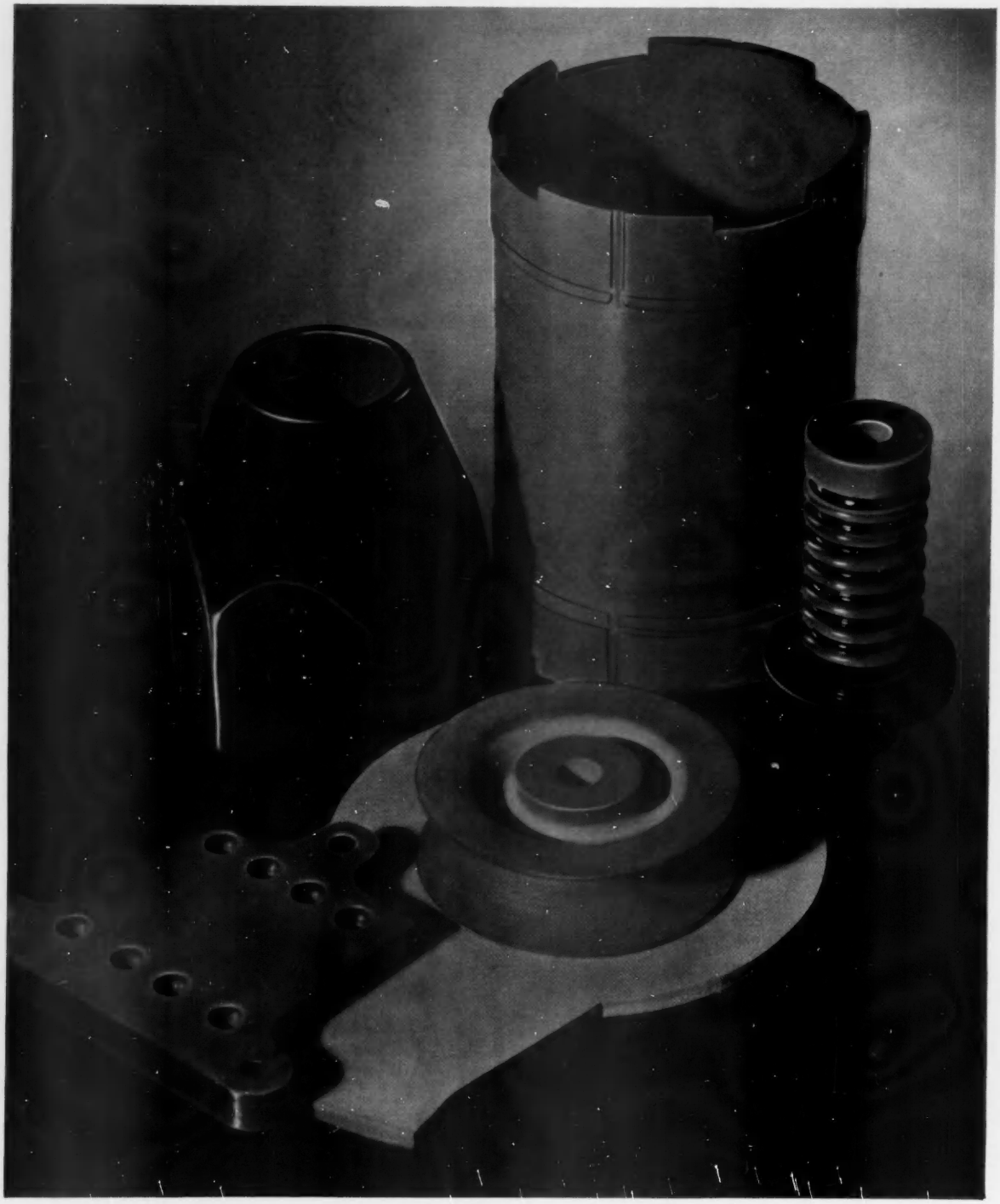

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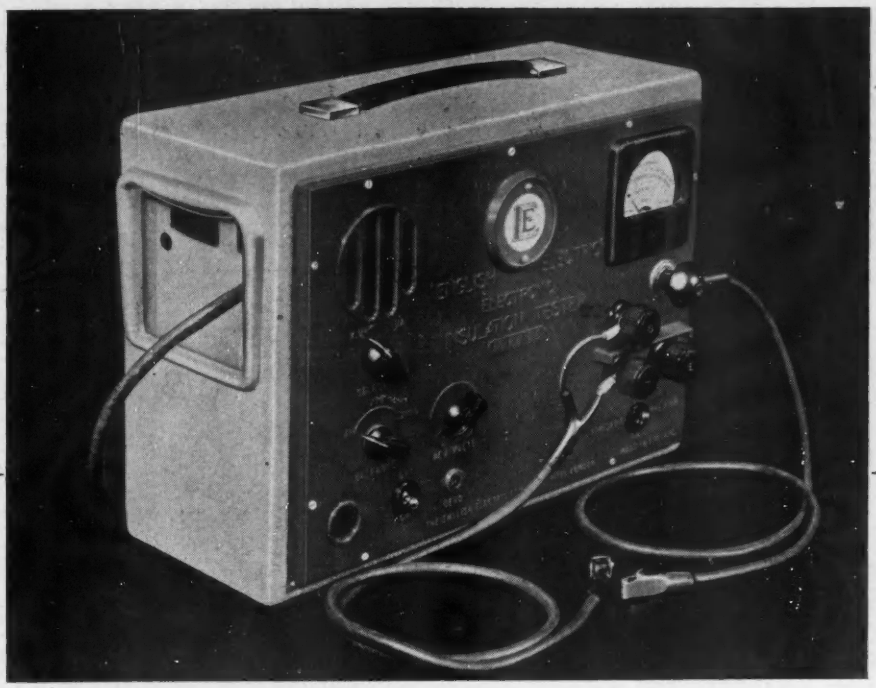

The 'ENGLISH ELECTRIC' electronic insulation tester provides for the first time 10 kV D.C. in a truly portable equipment having the following outstanding features :

- Non-lethal output adjustable from 500 to 10,000 volts.
- Measurement up to 250,000 megohms.
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- Rejection of surface leakage current.
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electronic insulation tester

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The FALCO ROYAL, with its Automatic Timing, is cooker and cook combined. It switches itself ON and OFF *automatically* at the times set for it. The Lady of the House can be out all day, and still come back to find the evening meal ready and piping hot!

Add these advantages—

* 3 Radiant Boiling Plates, each with a Simmerstat.
* High-level, almost eye-level, controls in back-plate.
* Light in back-plate shines right into pans.
* Built-in kettle plug.
* Biggest grill of any domestic cooker.
* Biggest oven of any domestic cooker.
* Removable oven linings, for easy cleaning.
* Attractive appearance—cream or white.

to sell at £85 (*list price, United Kingdom*)

The FALCO ROYAL Electric Cooker

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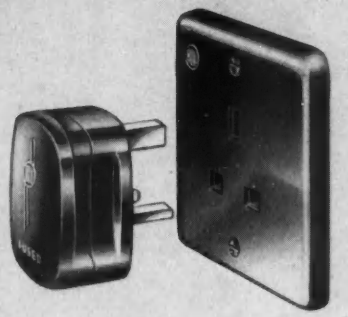

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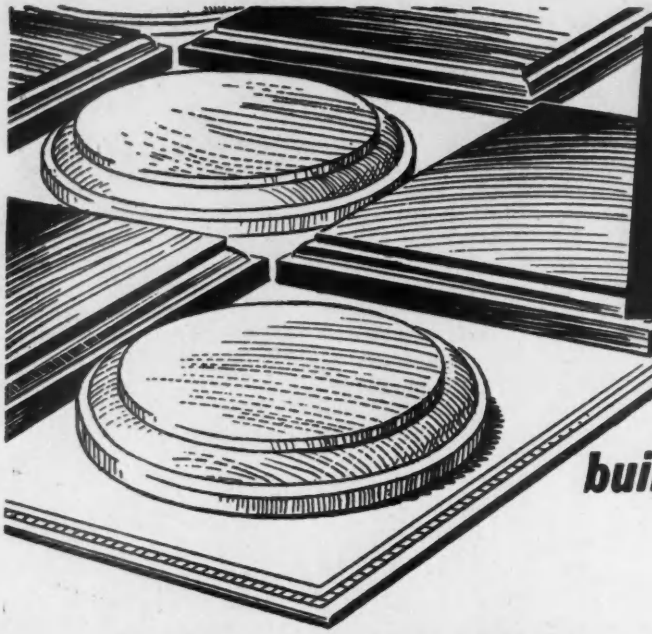

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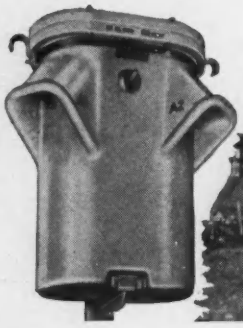
for rural distribution

in hermetically-sealed stoneware containers



Photograph by courtesy of British Insulated Callender's Construction Co. Ltd. and the North of Scotland Hydro-Electric Board.

- No maintenance costs. Containers are salt and acid proof. Supporting steel work is heavily galvanised. Hermetically sealed container protects oil from acidity.
- Increased efficiency and reduced operating costs due to low losses.
- High Overload Capacity.
- Simple installation—only one or two bolts required. Other types of distribution transformers, including units to the Draft National Standard Specification T.1. in steel tanks, can also be supplied.

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The reasons why *Pyramid* Black Ground Base utensils

Speed your Cooking...

Patent applied!

It is well known that black surfaces absorb radiant heat faster than light or bright finishes which tend to reflect heat. The demand for quicker boiling times and consequently lower Electricity Bills has been met. After more than a year of experiments PYRAMID present the new BLACK GROUND BASE range of quality utensils for use on cookers which have both Radiant and Solid hot plates. Rapid boiling, functionally designed, and built to traditional PYRAMID QUALITY Standards, this new heat absorbing BLACK GROUND BASE Range will be indispensable to those women desiring maximum speed and efficiency from their cooker.

Here's proof of NEW cooking economy!

Type of pan	Type of hotplate	Time in minutes and seconds			
		2 pts.	3 pts.	4 pts.	5 pts.
Light aluminium	1,600 watt radiant	8·42	11·25	13·05	15·30
Light aluminium	1,800 watt solid	10·02	11·55	14·25	17·50
Ground/black-base aluminium	1,600 watt radiant	7·28	10·03	11·45	14·16
Ground/black-base aluminium	1,800 watt solid	7·32	9·54	11·25	13·50

Our ability to meet your requirements and to build prestige through every sale is determined largely by our technical improvement policy: that is, the assistance we give you and your customers through our developments in utensil efficiency. Tested and proven, the new PYRAMID Black Ground Base utensils for electric cookers fitted with Radiant and Solid Plates are a very special part of that service, appealing quickly to a growing demand and building your sales through speed, efficiency and a reputation for leadership in the Development of Quality Utensils.

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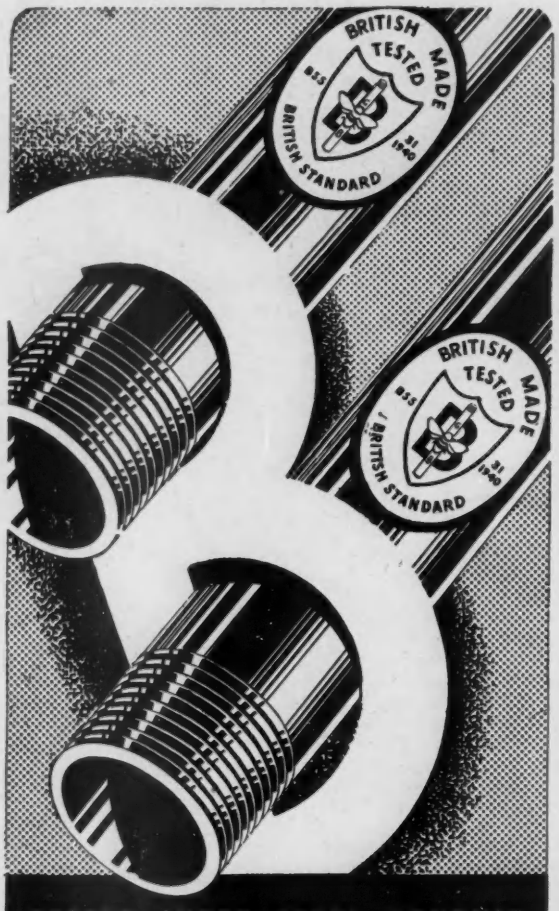

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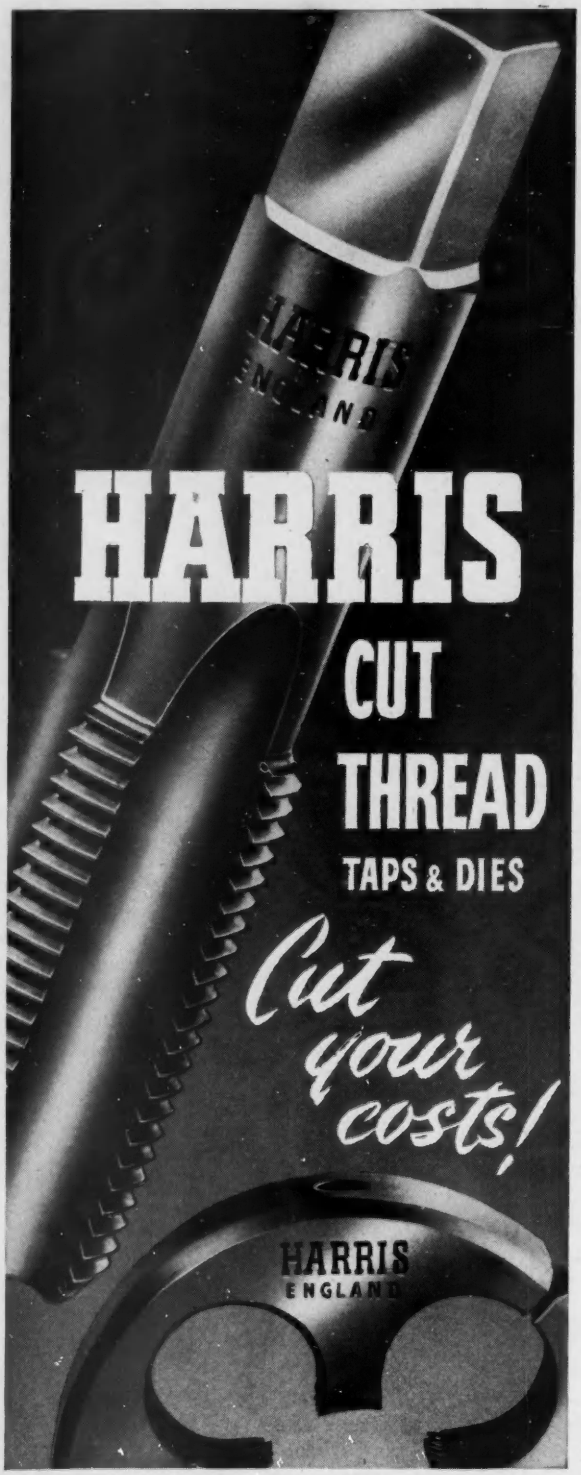

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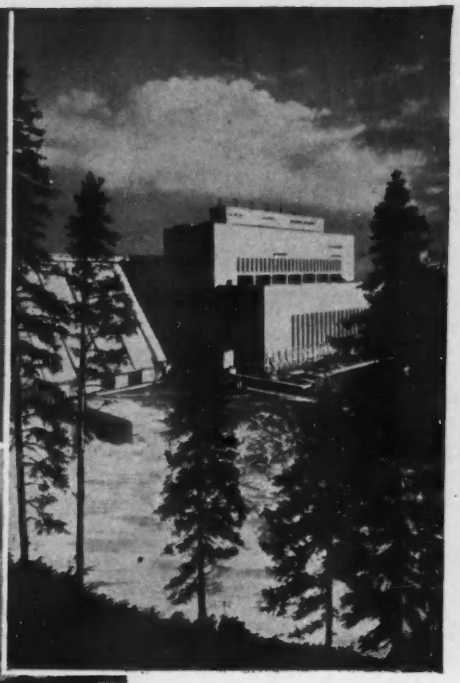

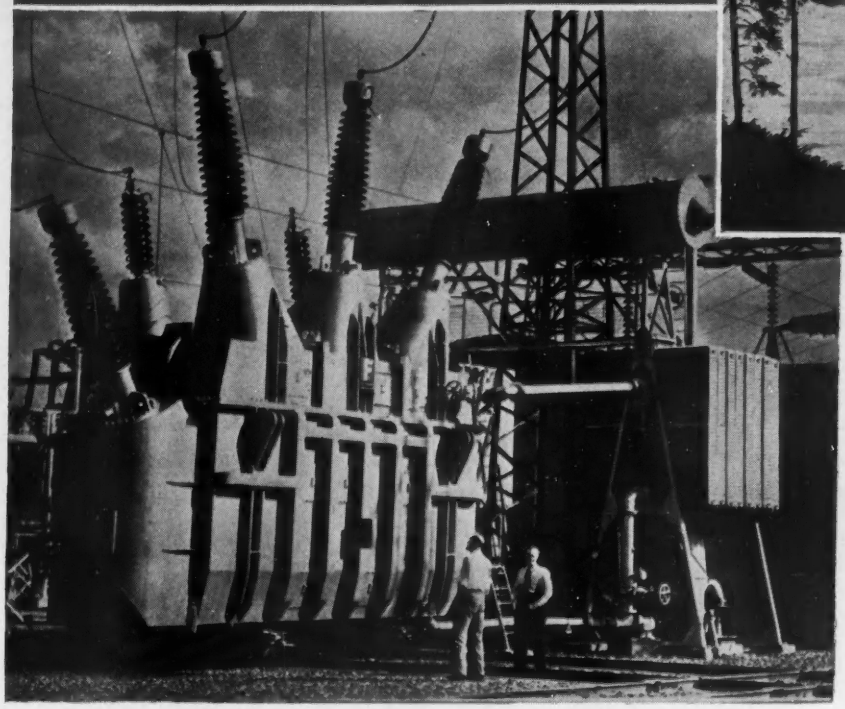

(Above). The Pyhäkoski Power Station, total output 108 MW, the largest in the current water power programme of Finland.
(Left). One of the completed transformers in commission at the Pyhäkoski Generating Station.

Five of the six 230,000 Volt three-phase transformers for the Imatra Power Company, Finland, are now in commission at the Pyhäkoski Generating Station and Hikia Transforming Station. They were the first 230,000 Volt three-phase transformers to be ordered in Great Britain, each transformer being rated at 64/64/32 MVA, 231/115·5/10·5 kV, and having a total weight with cooling gear of 220 tons.

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Since the early days of domestic electrical heating a great deal of research has been done. The result: the Brightray series of nickel-chromium resistance materials — outstandingly reliable, and with special grades to suit all domestic and industrial applications. Let us help you select the one most suitable for *your* requirements.

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BRIGHTRAY S for electric furnace elements working almost continuously at temperatures up to 1150°C.

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containing complete data on our electrical resistance materials? We will gladly send it free of charge on hearing from you on your business letterhead.

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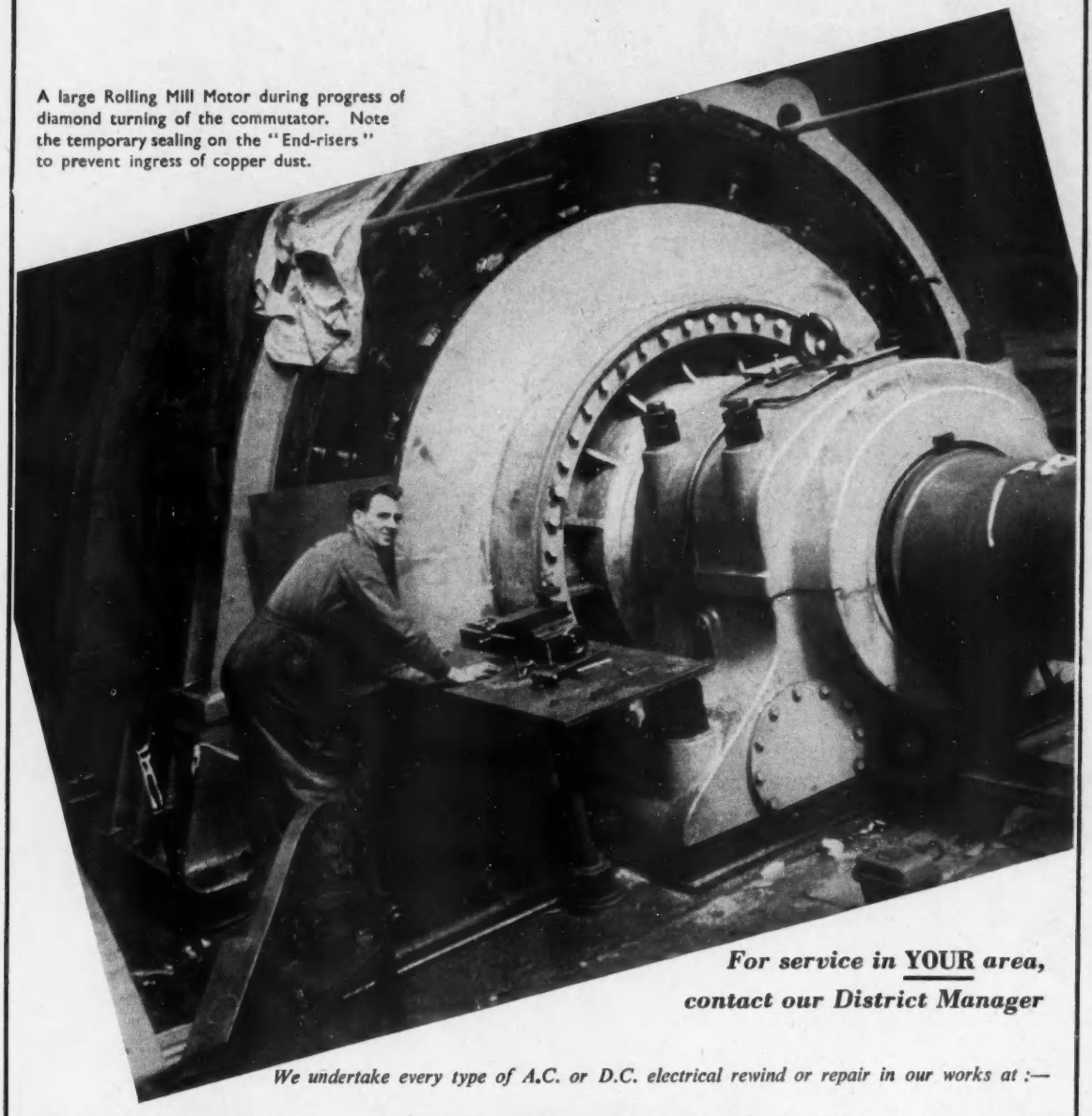
an example of site service given to users of large machines of this type

A large Rolling Mill Motor during progress of diamond turning of the commutator. Note the temporary sealing on the "End-risers" to prevent ingress of copper dust.



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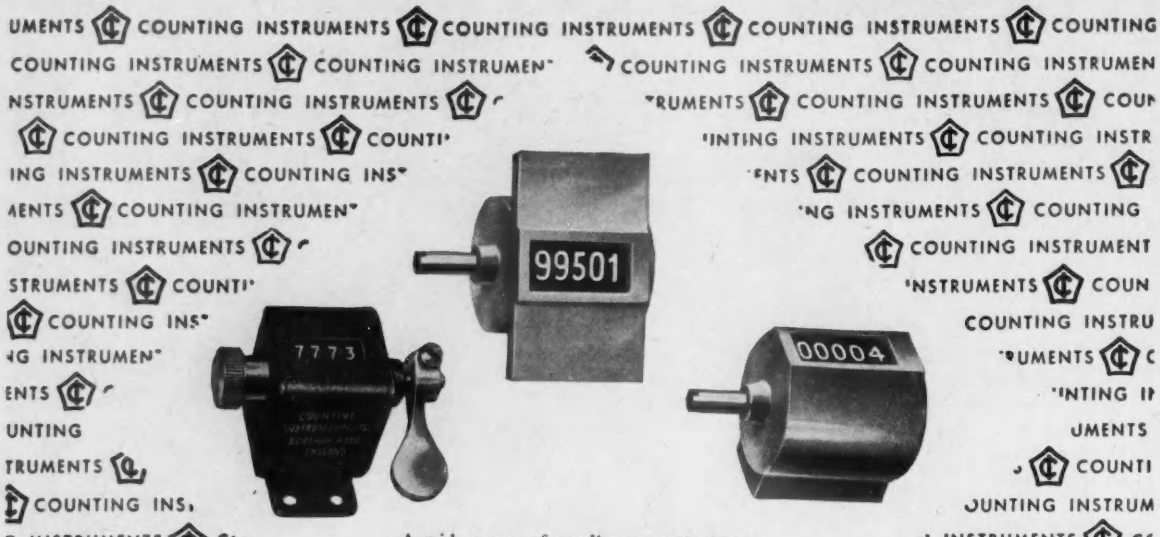

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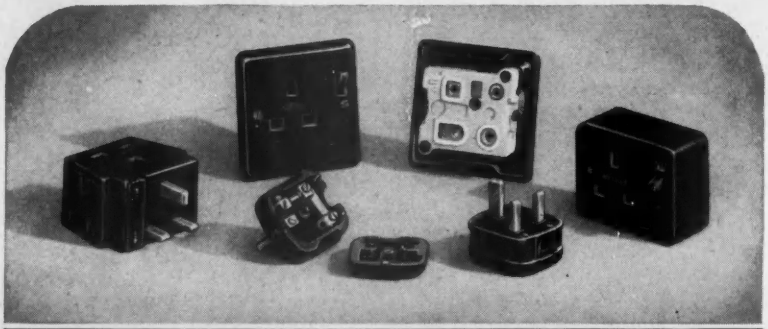
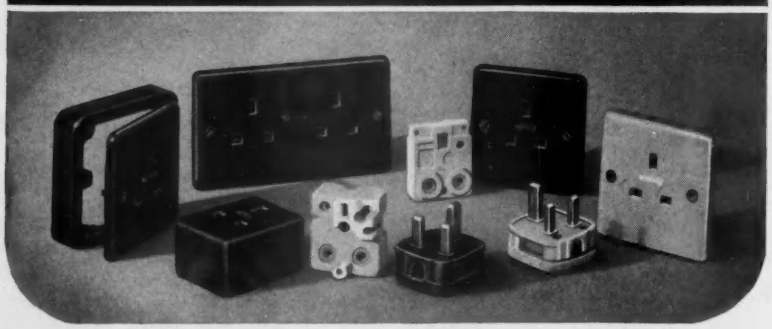


13 Amp. RING MAIN SOCKET OUTLETS & PLUGS



ALL NETTLE 13 Amp. Socket Outlets have a porcelain base and are manufactured strictly in accordance with B.S.S. 1363. The Flush Fitting Switch Socket Outlet, Ref. S.F. 1230 (top centre) will accept plugs to B.S.S. 1363 and can be mounted directly on to a B.S.S. 1299 box. The Switch is for A.C. use only and has silver contacts.

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Today the products of the Siemens Brothers Group of Companies at home and abroad are serving the needs of mankind throughout the world. How far it has already progressed may be seen by every visitor to the British Electrical Power Convention where, at the Siemens Brothers stand, a remarkable display of electrical enterprise is exhibited. To see it is to see tangible proof of Siemens leadership, and therein lies the reason why, over a wide field of electrical development, one name stands out in the electrical industry throughout the world. That name is Siemens Brothers.

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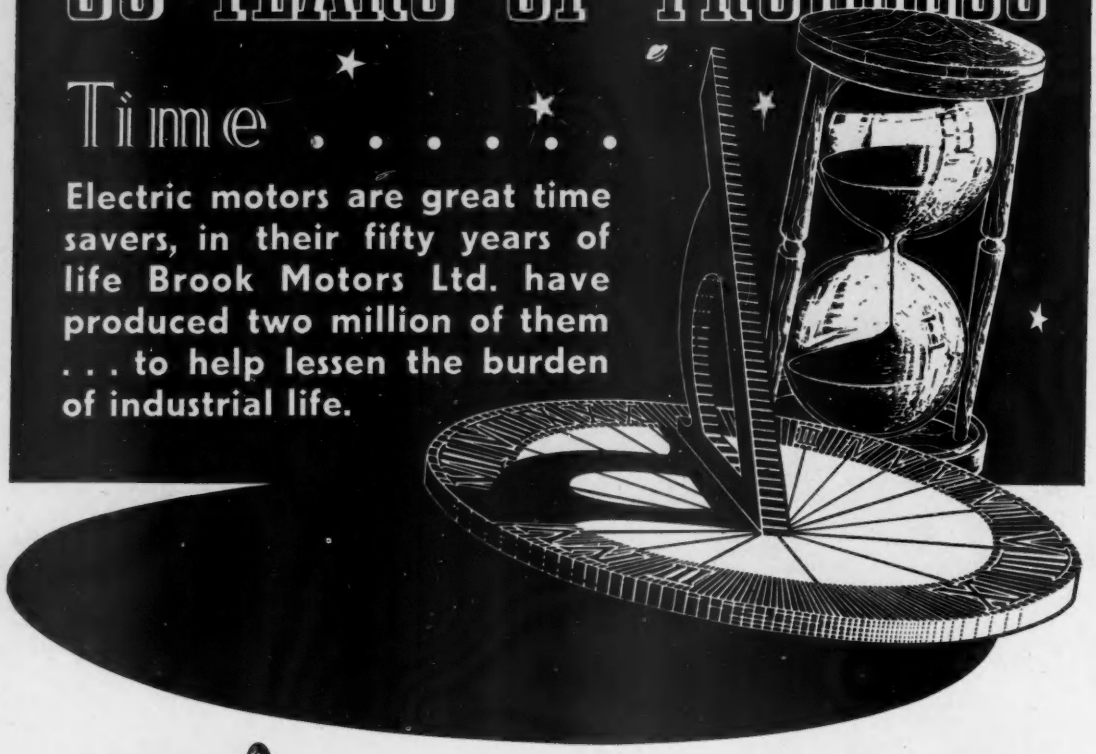
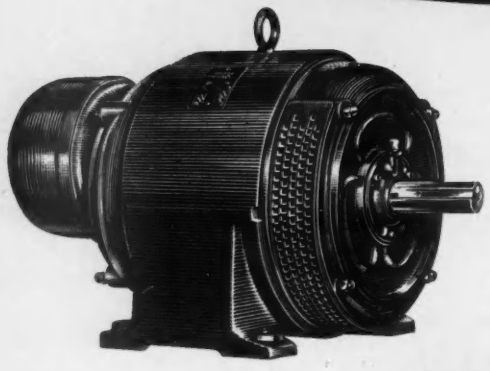
Electric motors are great time savers, in their fifty years of life Brook Motors Ltd. have produced two million of them . . . to help lessen the burden of industrial life.





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20,000 ohms per volt *plus* AUTOMATIC Overload Protection

Produced in response to a demand for a high sensitivity version of the world-famous Universal AvoMeter, this model incorporates the traditional design features of its predecessors, so highly valued for simplicity of operation and compact portability.

It has a sensitivity of 20,000 ohms per volt on all D.C. voltage ranges and 1,000 ohms per volt on A.C. ranges from 100 V upwards. A decibel scale is provided for audio frequency tests. In addition, a press button has been incorporated which reverses the direction of current through the moving coil, and thus obviates the inconvenience of changing over test leads when the current direction reverses. It also simplifies the testing of potentials, both positive and negative, about a common reference point. A wide range of resistance measurements can be made using internal batteries, separate zero adjustment being provided for each range.

It is of importance to note that this model incorporates the "AVO" automatic cut-out for protection against inadvertent overloads.

Size 8¼" x 7½" x 4½"
Weight 6½lbs. (including leads)

£23 : 10s.

For your Valve Characteristic Meter or Valve Tester

Owing to the very large number of valves which have been issued within the last two years, no further amendments will be issued for the original "AVO" Valve Testing Manual. A new, completely revised and fully up-to-date Valve Data Manual is now available from the Company at 15/- post free.

D.C. VOLTAGE	D.C. CURRENT	A.C. VOLTAGE	A.C. CURRENT	RESISTANCE
2·5V.	50μA.	2·5V.	100mA.	*First indication* 0·5Ω.
10V.	250μA.	10V.	1A.	*Maximum indication* 20MΩ.
25V.	1mA.	25V.	2·5A.	0—2,000Ω { using internal batteries.
100V.	10mA.	100V.	10A.	0—200,000Ω { using internal batteries.
250V.	100mA.	250V.	—	0—20MΩ { using internal batteries.
1,000V.	1A.	1,000V.	—	
2,500V.	10A.	2,500V.	—	0—200MΩ { using external batteries.

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
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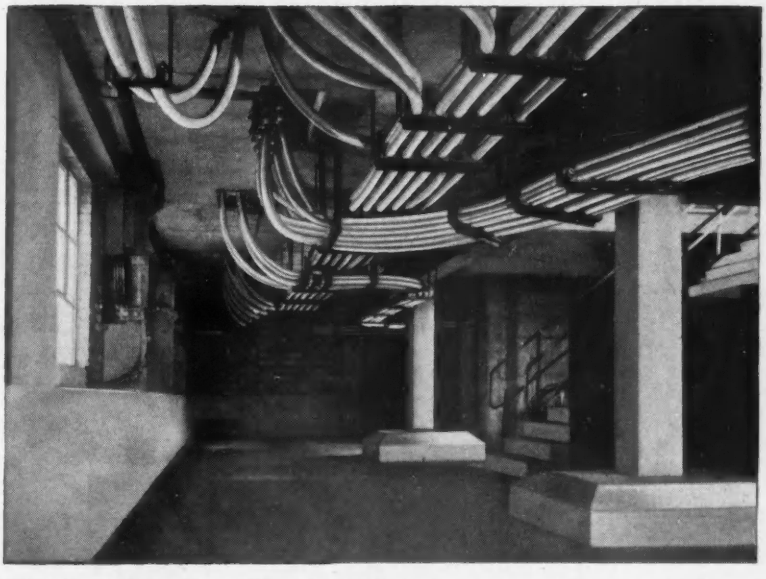
Cables by EDISWAN



To facilitate increased production of beet sugar at the Kidderminster and Poppleton factories of the British Sugar Corporation Ltd., a complete re-planning of the L.T. power and lighting distribution schemes was recently undertaken. This work, involving the erection and jointing of some 4,000 yards of Ediswan paper-insulated mains cable in each factory, was designed and carried out by the Cable Contracts Department of The Edison Swan Electric Co. Ltd., in association with the Corporation's engineers.

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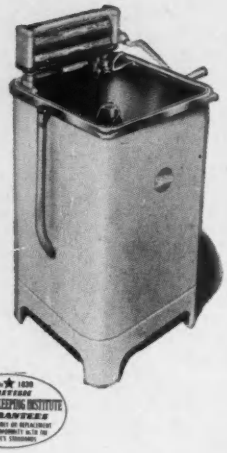
SWIRLUX 500H Model (as illustrated) heats the water, 6 lb. dry weight capacity, 12" hand wringer which folds down when not in use. Exclusive Swirlux agitator. (Non-heated version 500 Model also available.)



Two Famous Brands

VERSCO SQUARE BOILER (as illustrated). This smart and compact boiler is fitted with castors for easy movement and is finished in cream stove enamel. The table-top in cream vitreous is an attractive feature.

VERSCO ROUND BOILER. Obtainable in Galvanised finish (a most durable finish of special appeal for Corporation and other housing schemes) or in cream stove enamel.

THESE FEATURES ARE COMMON TO ALL VERSCO MODELS—Heavily tinned 10 Gallon copper container—Double pole, 3 heat rotary switches, A.C. or D.C. (safety cut-out available if required)—Chromium-plated taps with heat-resisting handles—Six 500-W clamp-on elements give maximum loading of 3 kW — Top surrounds in die-cast aluminium and pressed aluminium loose lids for easy access. Send for new leaflet giving full specifications and prices.

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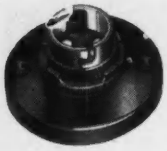
SHADE CARRIER PATTERNS



A731
BATTEN MOUNTING

A754
'TITAN' MOULDED CORD GRIP

A756
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DOUBLE POLE PUSH BAR SWITCHED TYPE

A1666
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A1671
CORD GRIP

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A1691
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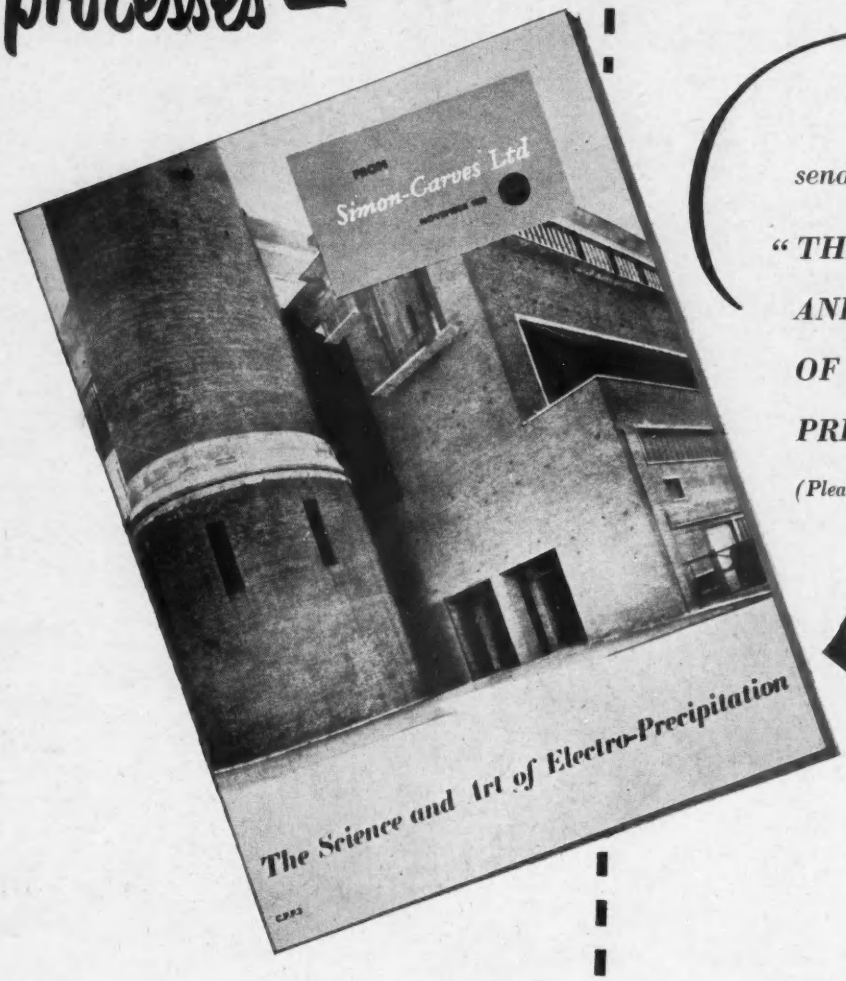
For a quarter of a century Simon-Carves have pioneered improvements and innovations in the design and construction of electro-precipitators and can to-day apply that experience to new fields in which electro-precipitation is proving the solution to an increasing variety of dust problems.



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(Please Quote C.P.P.3)

High efficiency electro-precipitation by ***Simon-Carves Ltd***

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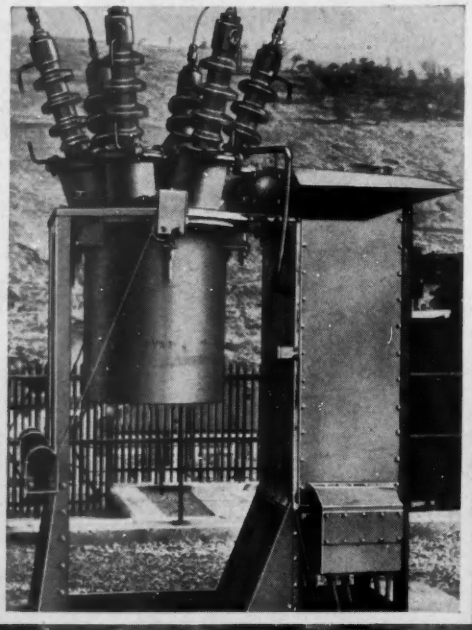
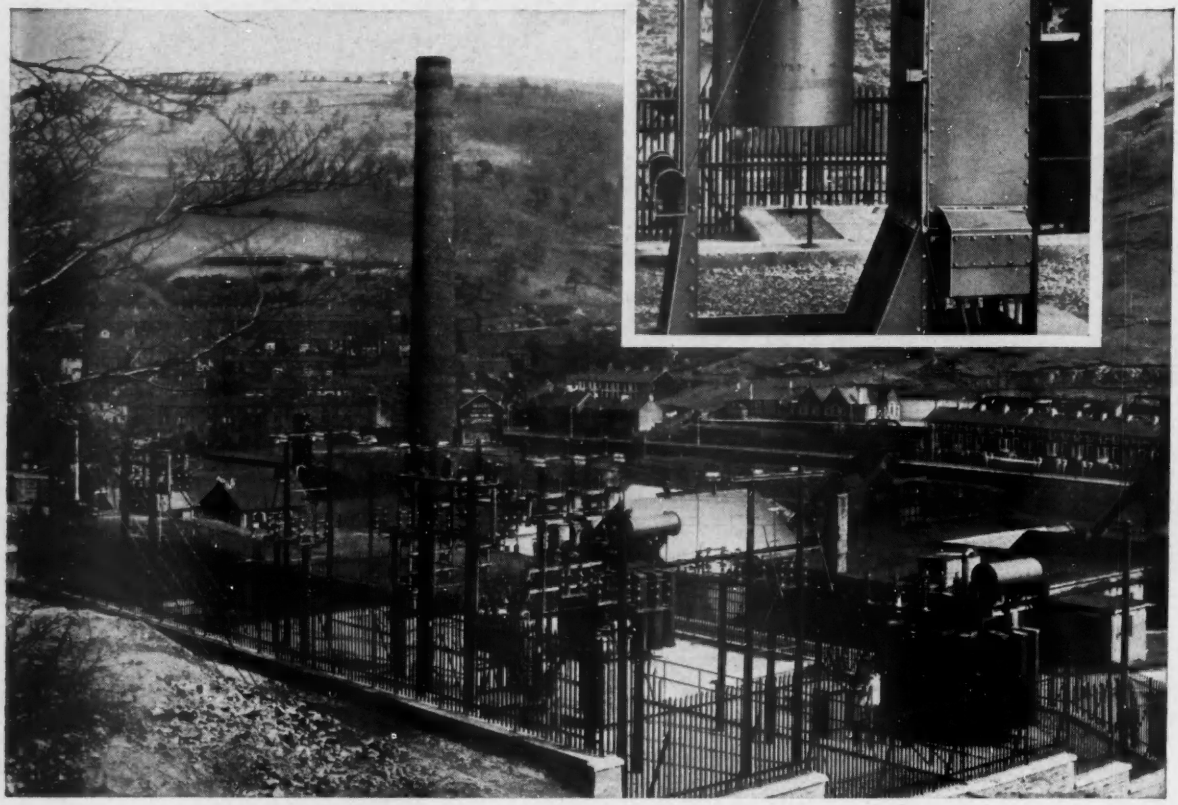
A Monmouthshire colliery sub-station equipped with S.W.S. 33,000-volt, 500-M.V.A outdoor oil circuit breakers.

CERTIFIED TEST PERFORMANCE AT 33kV : 50 TO 1,000 M.V.A.





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Highest Thermal Efficiency

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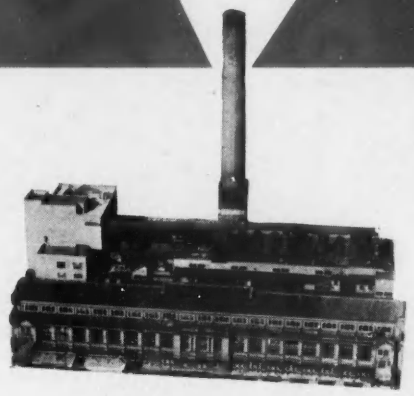

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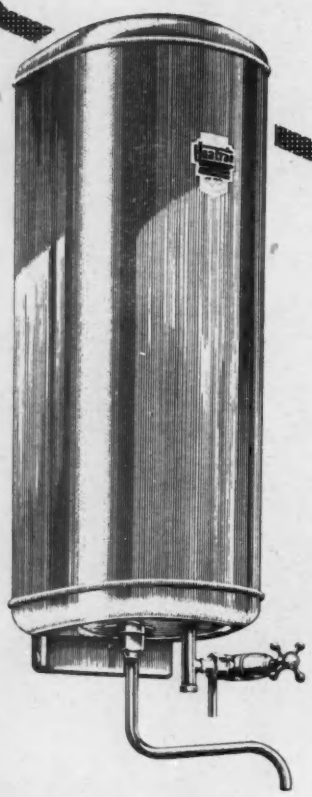
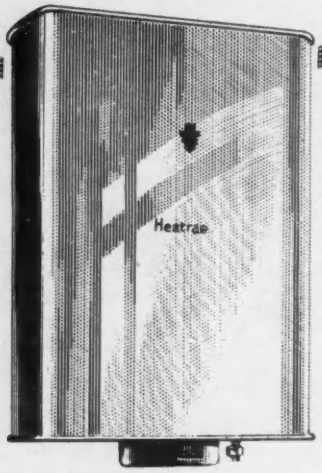
ELECTRIC WATER HEATERS . . . *ARE SO SIMPLE*

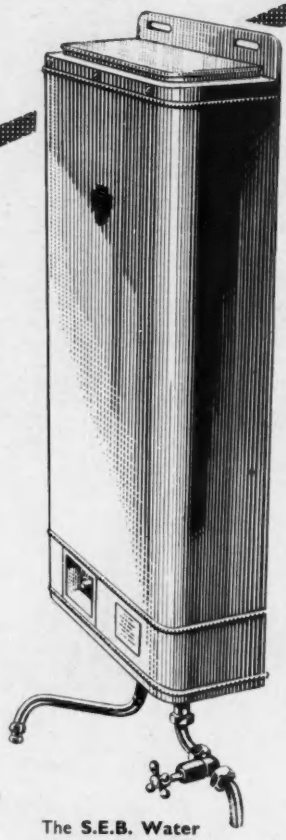
Simplicity of design and quality-first manufacture are the guiding principles that ensure the trouble-free and durable performances for which Heatrae products have achieved world-wide repute.



Meet the **"DOT"** . . . the dependable economical and safe Electric Water Heater. Specially designed to fit unobtrusively into any odd corner where space is limited. Neat, attractive, efficient.



Heatrae's **F.B. Storage-type Heater** is a self-contained, complete hot-water system compacted within minimum dimensions and operating on the lowest current consumption.



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Ideal for occasional use: lagging and thermostatic control conserve heat and ensure utmost economy.

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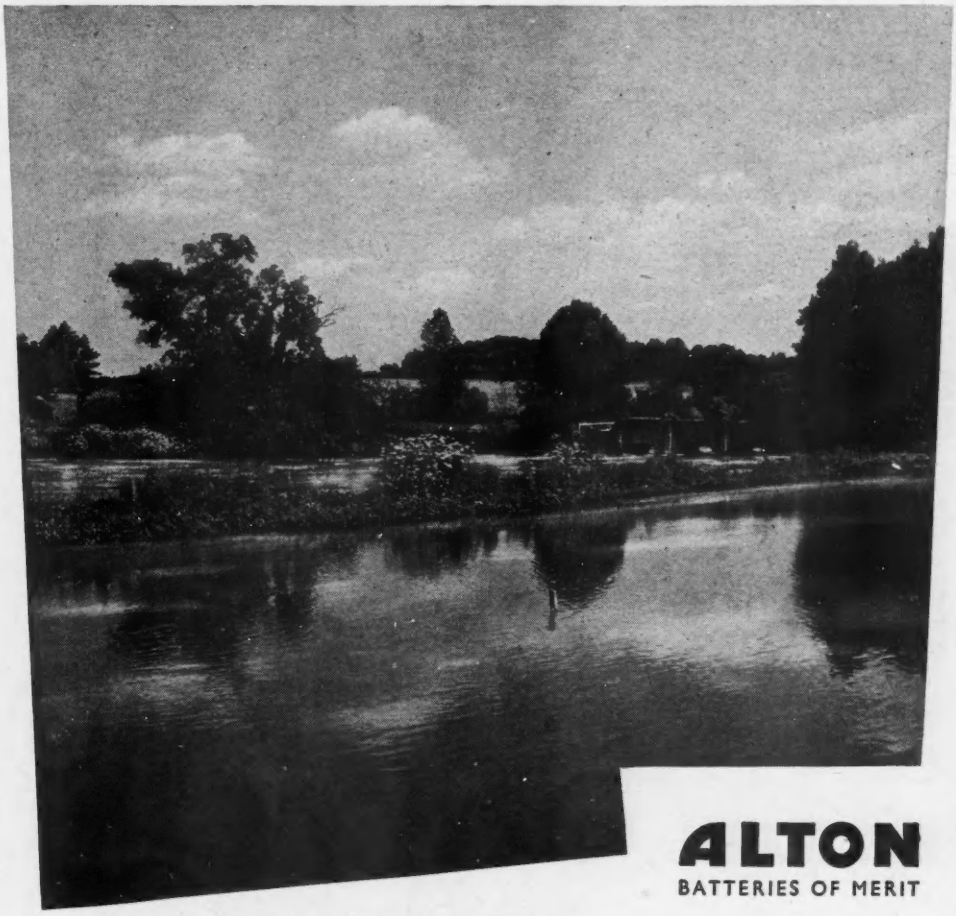
From Alton go batteries to power stations all over the world. Batteries, as their distant users tell us, that possess a certain distinctive merit all their own. Surprising, in these days of uniformity and standardisation? But Alton, in such an age, is perhaps a surprising place. Alton's a small country town, with a friendly, satisfying life of its own. A natural place unchanged, unspoiled, where the surrounding streams run down through lovely and varied country to feed the river Itchen pictured below. Where a man at leisure can follow his bent, be it sport or hobby or just plain peace of mind. Where a life worth living, a job worth doing are any man's natural right : and pride in himself and the work of his hands is a wholly natural consequence.



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Alton stationary batteries: 10 to 15,000 Ah. Also in regular production, renewal plates for all makes of battery, British and Continental

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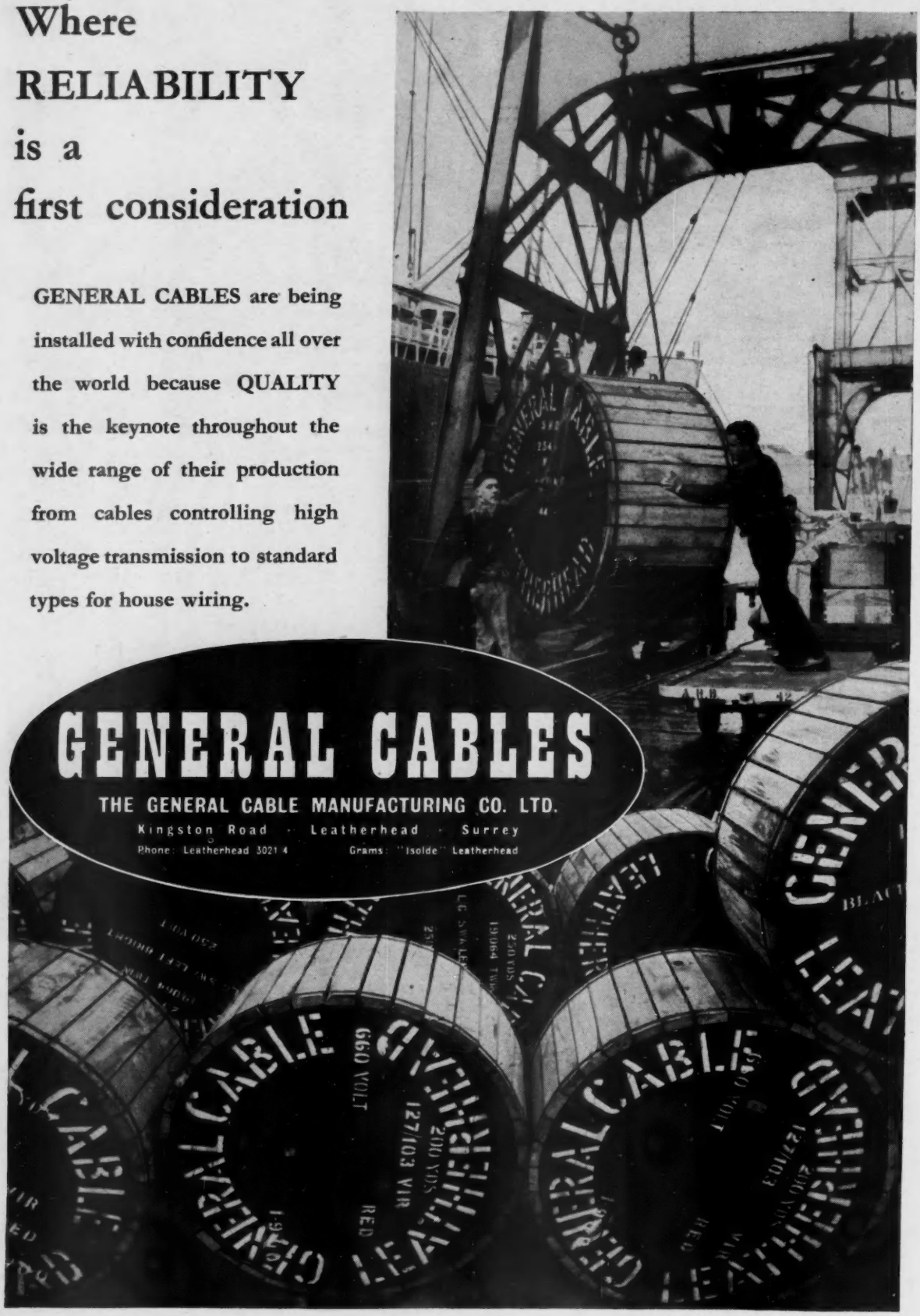
GENERAL CABLES are being installed with confidence all over the world because QUALITY is the keynote throughout the wide range of their production from cables controlling high voltage transmission to standard types for house wiring.



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BALL & ROLLER R&M BEARINGS

They save in the long run!

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THERE IS A BEARING FOR EVERY INDUSTRY'S NEED

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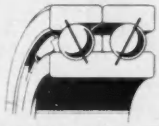
OUR ENGINEERING DEPARTMENT WILL WELCOME THE OPPORTUNITY TO CONSIDER YOUR SPECIFIC APPLICATIONS AND MAKE RECOMMENDATIONS.

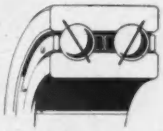
DOUBLE PURPOSE BEARINGS

Double Purpose (or as they are sometimes known—Angular Contact Bearings) were first manufactured in this country by RANSOME & MARLES BEARING CO. LTD.

By the use of a one piece cage the maximum number of balls can be assembled in the bearing, thus obtaining the maximum load carrying capacity. The tracks are so disposed that when correctly mounted the balls have angular contact with the tracks.

The bearings are therefore pre-eminently suitable for combined journal and thrust loads (in one direction only) or for thrust loads only, particularly where speeds are in excess of those at which the washer type thrust bearing will operate. This series is also suitable for pre-loading.



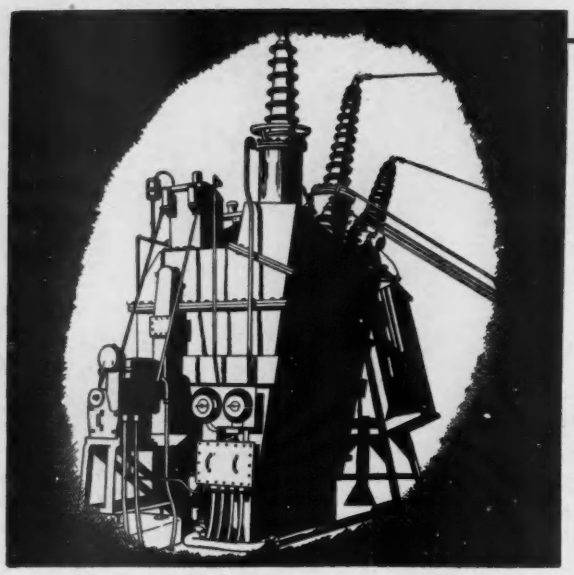


Two types of Double Row Double Purpose Bearings are made, one where two rows of balls run in tracks on a common inner ring, but have two separate outer rings, and the other having one piece outer and inner rings. Of these the former is to be preferred, having a greater load carrying capacity, and, further, can be supplied with pre-load on the balls.

R&M Duplex Double Purpose Bearings are also included in this series. This bearing, having a divided inner ring, is suitable for thrust in either direction, and if the thrust loads predominate, can be used for combined journal and thrust loads.

RANSOME & MARLES BEARING CO. LTD., NEWARK-ON-TRENT, ENGLAND

K/RM114



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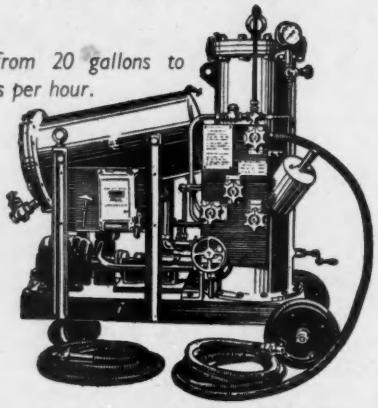
Complete Drying and Purification giving Maximum Breakdown Voltage in one simple operation. No heating. No fire risk. Weatherproof. Fully mobile units. Used by leading Electricity Undertakings throughout the World.

Capacities from 20 gallons to 1,000 gallons per hour.

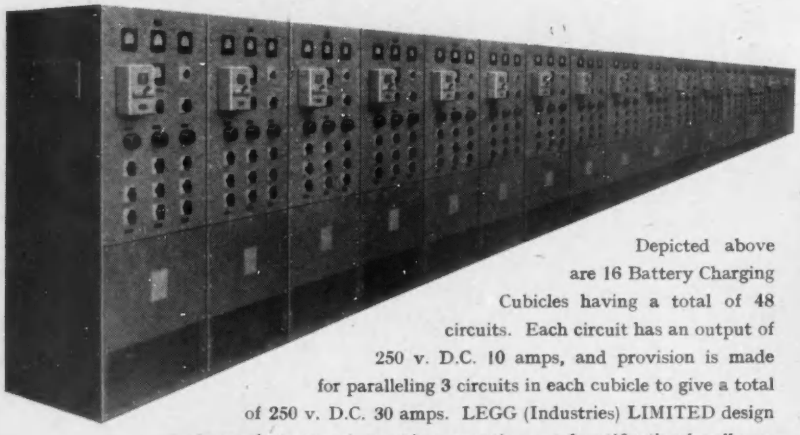


METAFILTRATION

THE METAFILTRATION COMPANY LIMITED
BELGRAVE ROAD, HOUNSLOW, MIDDLESEX

★ *PHONE: HOUNSLOW 1121/2/3*
GRAMS: METAFILTER, HOUNSLOW

16 BATTERY CHARGING CUBICLES



Depicted above are 16 Battery Charging Cubicles having a total of 48 circuits. Each circuit has an output of 250 v. D.C. 10 amps, and provision is made for paralleling 3 circuits in each cubicle to give a total of 250 v. D.C. 30 amps. LEGG (Industries) LIMITED design and manufacture equipment incorporating metal rectification for all purposes where a D.C. supply is required from an A.C. source, also Transformers, Air Cooled and Oil Immersed, up to 150 kVA Capacity.

This panel has been specially designed and manufactured for an overseas customer.

A section of the rear view of 3 typical cubicles.

Legg (INDUSTRIES) LTD · WILLIAMSON ST · WOLVERHAMPTON

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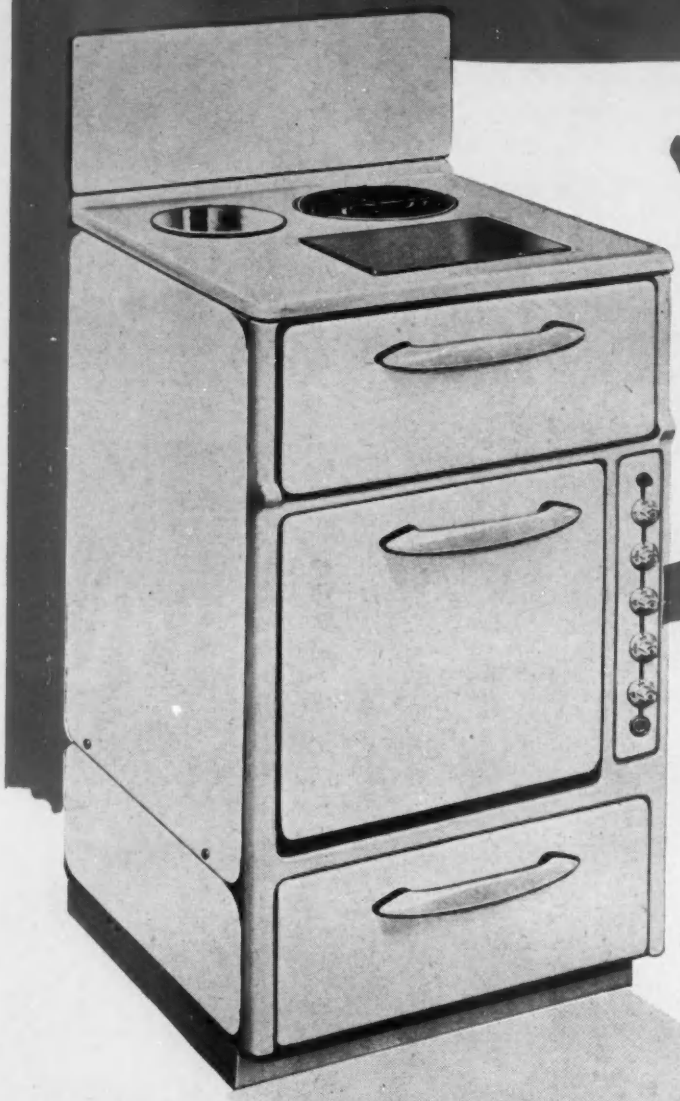
THE METROPOLITAN ELECTRIC CABLE & CONSTRUCTION Co. Ltd.

CLYDE WORKS • CHADWELL HEATH • ESSEX

TEL.: SEVEN KINGS 1810 **GRAMS: METROCABLE**

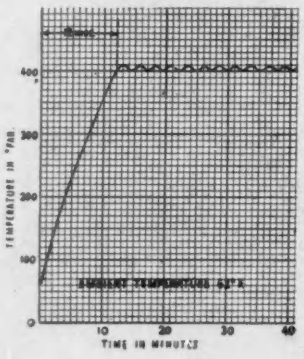
No. A.7



the new

THE LUXURY COOKER at a MIDDLE-CLASS PRICE

THE 'SPEEDHEAT' HALVES PRE-HEATING TIME!



Ultra-quick 'Speedheat' elements coupled with high-reflectivity enamel and controlled circulation give the C.90's 'Speedheat' oven an exceptionally fast pre-heating time.... 400° in 12 minutes, with a loading of only 2,500 watts— only half the time of many popular cookers.

B·N·E C.90

WITH THE SPEEDHEAT OVEN

All the features of the popular C.49—sound construction, cast iron main frame and hob, drop-down counterbalanced doors—PLUS

- ★ **a new look to match its wonderful performance**
- ★ **delightful pearl-grey vitreous enamel interior**
- ★ **Pyrex glass casserole/grill pan**
- ★ **the remarkable 'SPEEDHEAT' oven**
- ★ **heated storage drawer**
- ★ **and above all, top quality in every detail**

Dimensions: 36″ × 21″ × 21″, splash plate 9″.
Loadings: Oven, 2,500 w; Grill boiler, 2,000 w; 8″ radiant plate, 1,800 w; 6¼″ solid plate, 1,000 w; Drawer, 500 w.
Price: **£48** including 8″ radiant with simmer control, fuses and heated drawer. No Extras.
Full colour leaflet, EC. 14, sent on request.

GLASS CASSEROLE GRILL PAN

This attractive heat-resisting glass casserole is exclusively made by Pyrex for B.N.E. With the patent handle-grip*, the dish becomes a grill-pan while the lid and the dish form useful cooking and serving dishes.

* Licensed under Brit. Pat. 689,481.

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The Domestic Appliance Section of

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NEWARTHILL · MOTHERWELL · SCOTLAND

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Motor Control Gear

¼ H.P. up to 5,000 H.P.

Type C.S.10 (15 H.P.) Contactor.

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Type R.S.5. Combined Type Stator and Rotor Starter.

S.D.10 Type Starter

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If you are not sure what type of starter you require, ask one of our engineers to advise you.

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PLASTIC
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CABLES

More than equal to the extra service demanded

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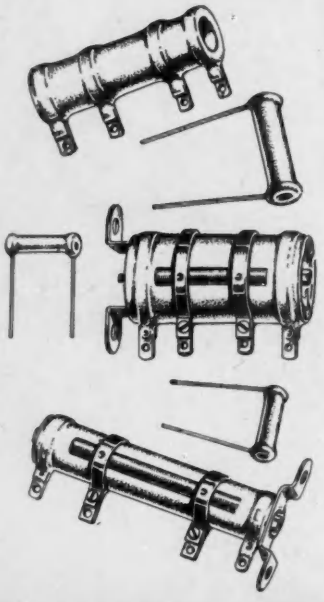
WIRE WOUND RESISTORS

C.R.M. resistors are wound on high grade low loss ceramic tubes. They can be coated with — Silicone Resins — Vitreous enamel or Cement with terminations to suit customers requirements.
C.R.M. resistors have a low temperature Co-efficient of resistance, are of robust construction and can be used under conditions where reliability and stability are important factors.
Good delivery — Low prices.
We shall be pleased to quote for your requirements.



COMMERCIAL RESISTOR MFG. Co. LTD.
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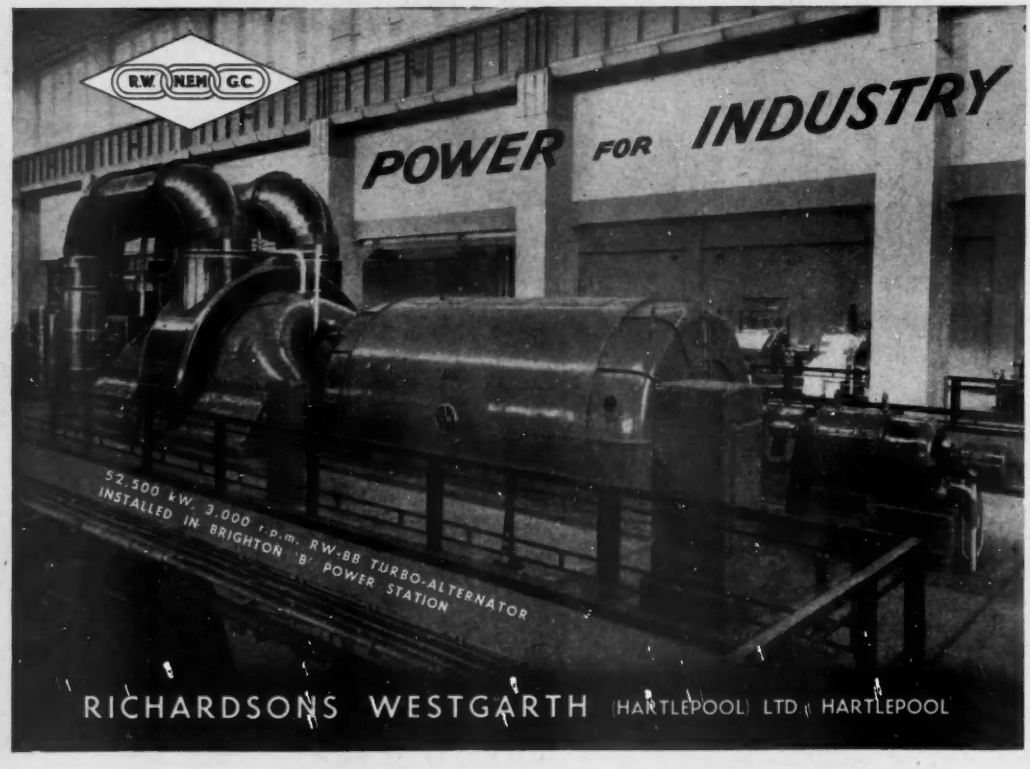
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POWER FOR INDUSTRY
52,500 kW, 3,000 r.p.m. RW-BB TURBO-ALTERNATOR
INSTALLED IN BRIGHTON 'B' POWER STATION
RICHARDSONS WESTGARTH (HARTLEPOOL) LTD HARTLEPOOL

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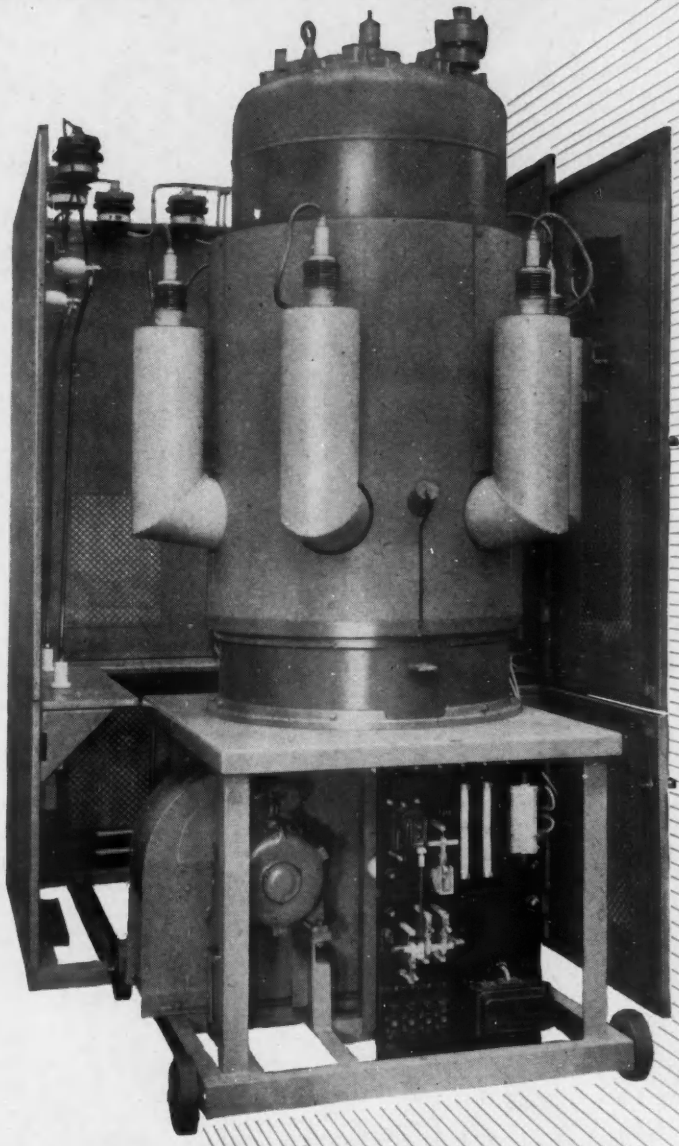

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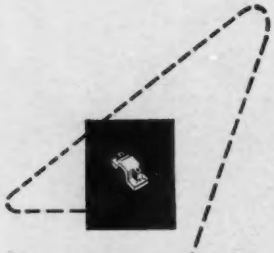

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Taylor Tunnicliff, who have a world wide reputation for the excellence of their POST INSULATORS are now supplying the majority of the Post Insulators for the British 275 kV Super Grid.

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FIRST QUALITY
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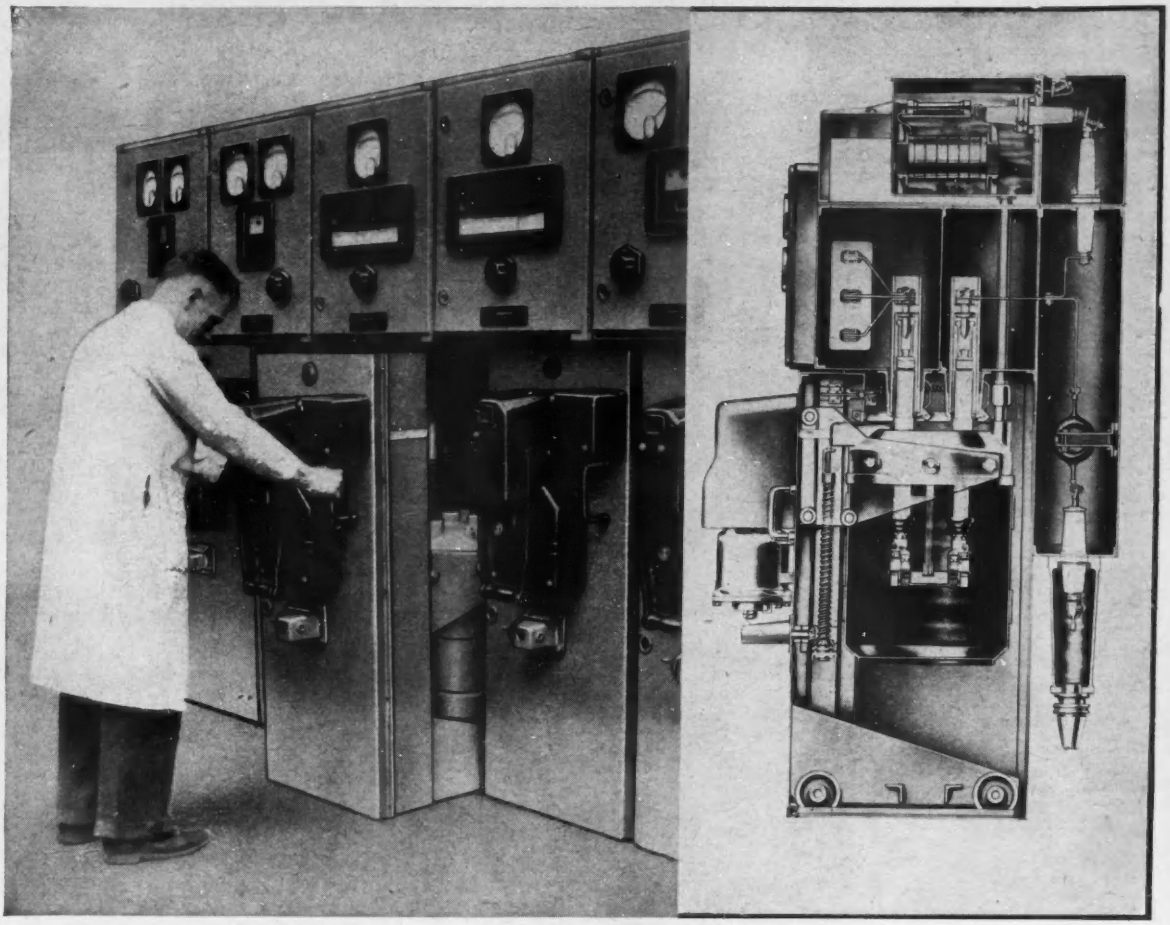

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Vertical Draw-out Metalclad

Fabricated steel housing with a solid floor plate * All-round accessibility to contact components * Manual, spring or solenoid closing mechanism * Draw-out self-contained voltage transformers with accessible fuses. * Current transformers changeable without structural alteration * Busbars, instrument transformers and circuit breakers separately housed * Available as illustrated or flush-mounted * Ratings up to 1,200 amperes—15kV. ***Publication No. 41002/1 describes the Brush equipment fully. Please write for your copy.***

This Switchgear can be seen on Stand 9 at the British Electrical Power Convention Exhibition, Eastbourne, June 14th-18th.

Switchgear by BRUSH

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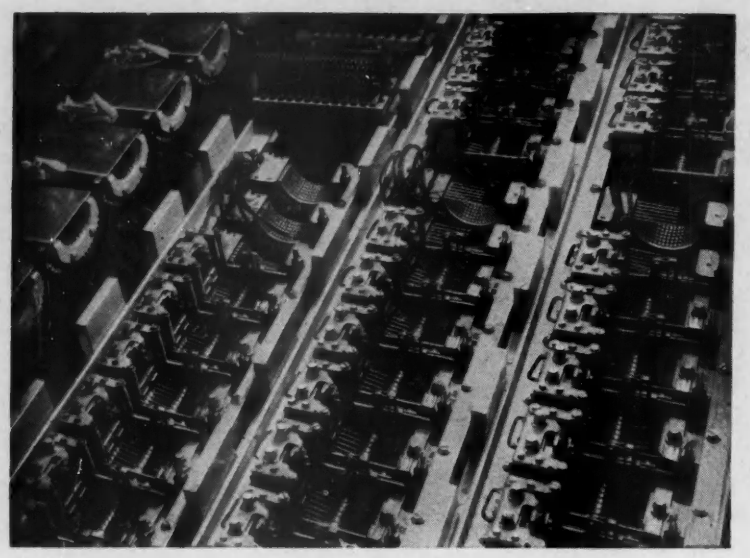
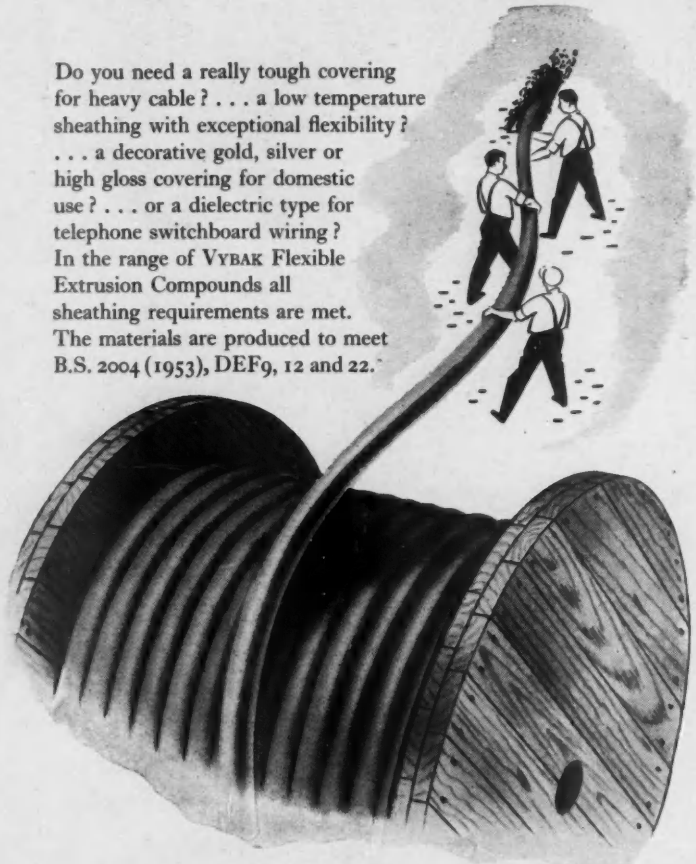
Right for every job



Do you need a really tough covering for heavy cable? . . . a low temperature sheathing with exceptional flexibility? . . . a decorative gold, silver or high gloss covering for domestic use? . . . or a dielectric type for telephone switchboard wiring? In the range of VYBAK Flexible Extrusion Compounds all sheathing requirements are met. The materials are produced to meet B.S. 2004 (1953), DEF9, 12 and 22.



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Heat Ageing	*outstanding properties*
Weathering	*highly resistant to normal weathering*
Flame Resistance	VYBAK *Plastics will not support combustion.*
Abrasion Resistance	*extremely good*
Flex Life	*test results often exceed a million cycles*
Chemicals	*resistant to alcohol, petrol, oils, solvents and most acids or alkalis*
Colours	*over 150 already being produced*

Comprehensive data sheets for all grades are available on request. Please state your special interest. Rigid extrusion compounds and moulding compounds also supplied.

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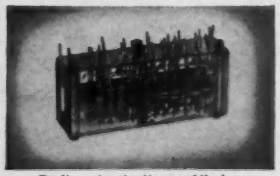
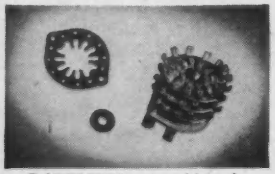
OTHER PRODUCTS OF BAKELITE LIMITED

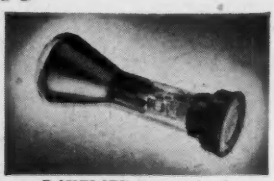
Telephone receiver base in BAKELITE rubber-modified polystyrene material



Radio circuit "potted" in BAKELITE Polyester Resin



BAKELITE Laminated is used for insulation of switches etc.



BAKELITE Cements bond the base to the cathode tube

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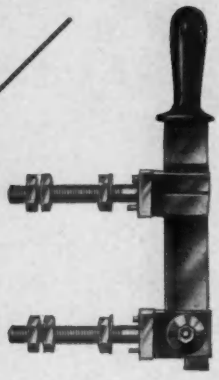

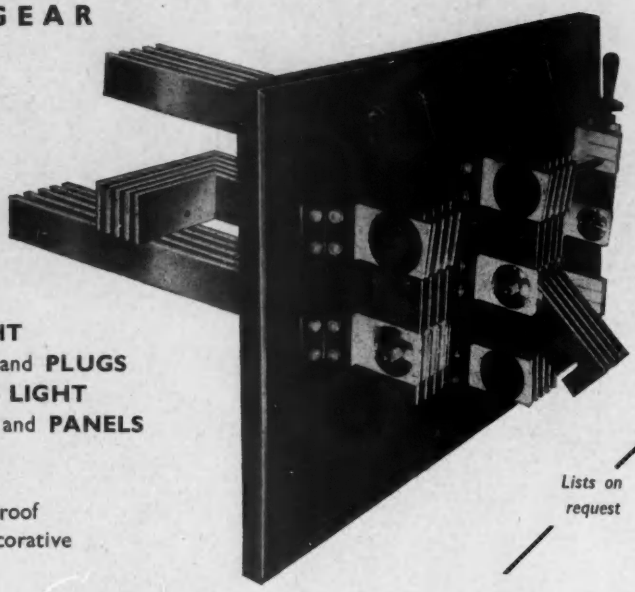

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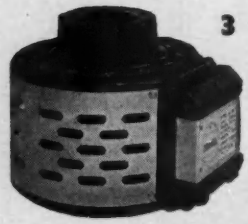
3

2

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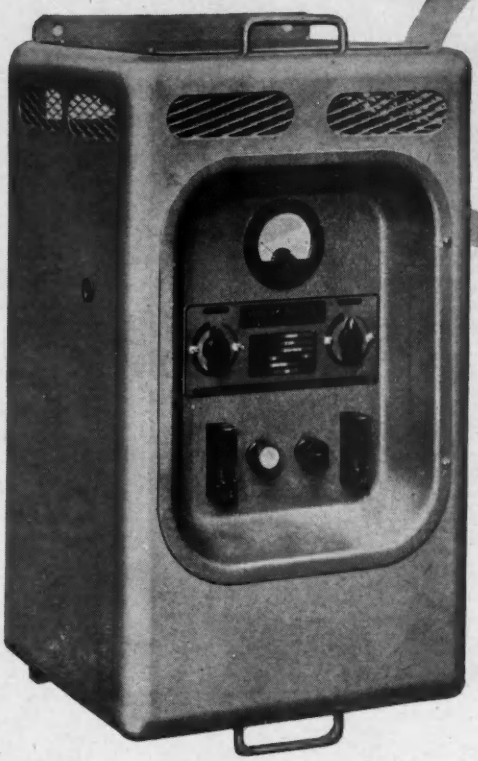

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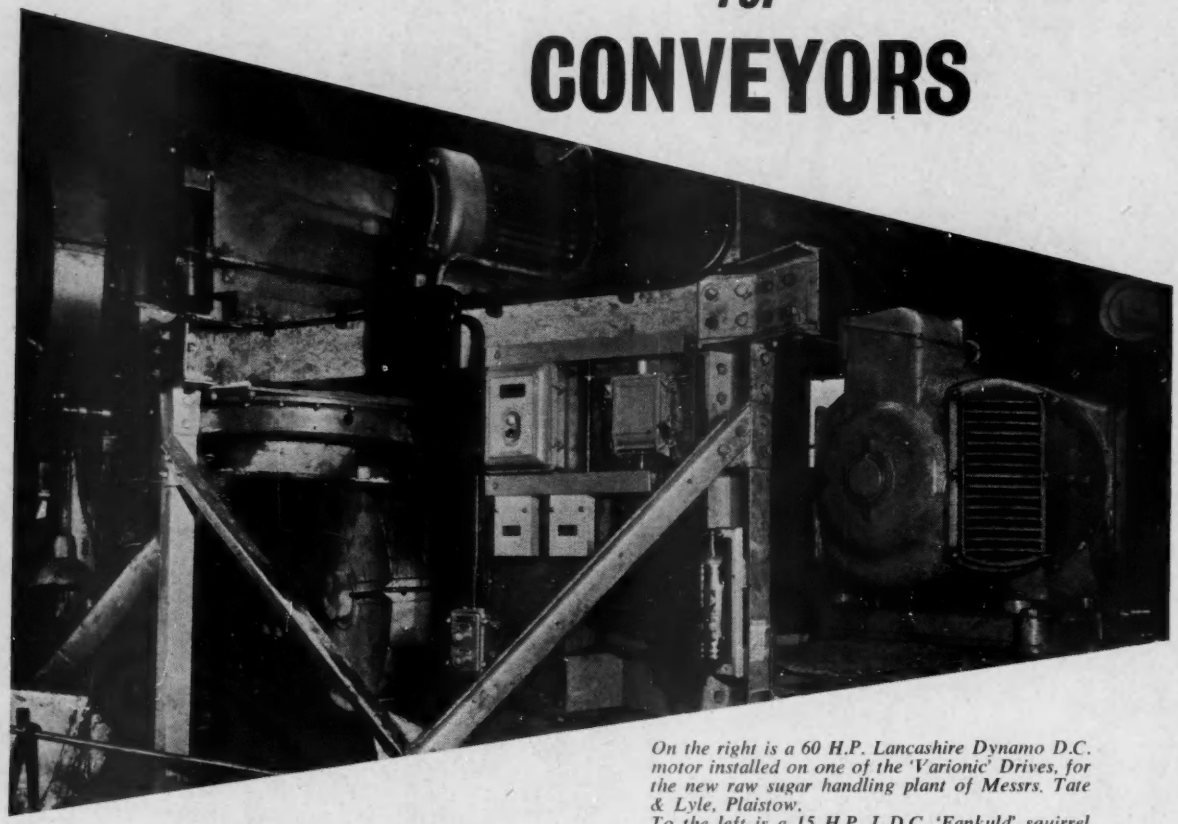

On the right is a 60 H.P. Lancashire Dynamo D.C. motor installed on one of the 'Varionic' Drives, for the new raw sugar handling plant of Messrs. Tate & Lyle, Plaistow.
To the left is a 15 H.P. L.D.C. 'Fankuld' squirrel cage motor driving a coal conveyor.

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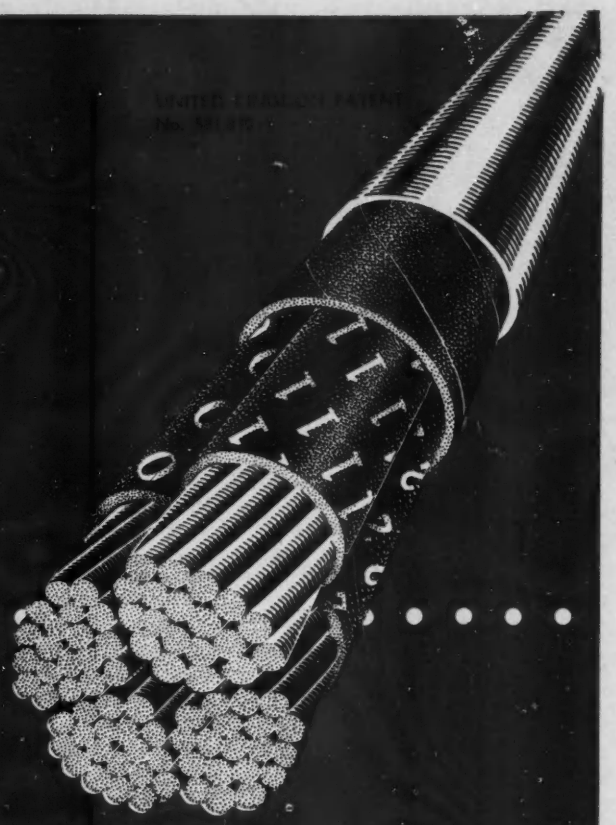

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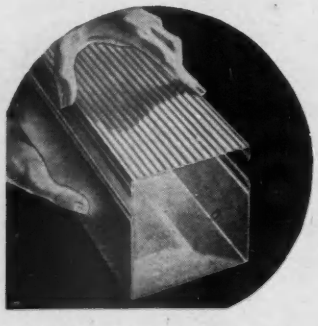

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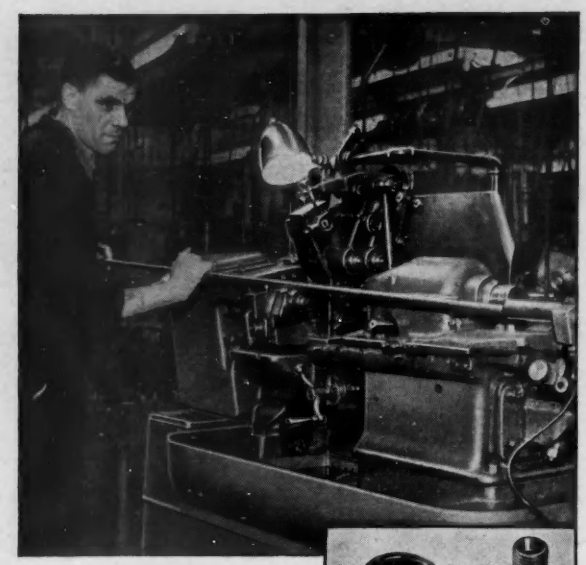

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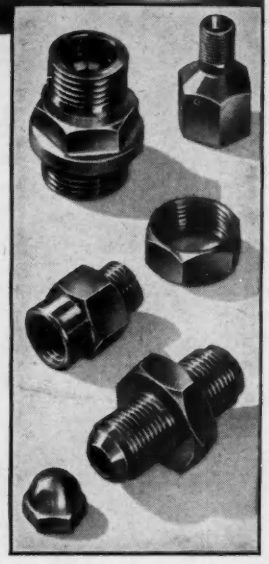

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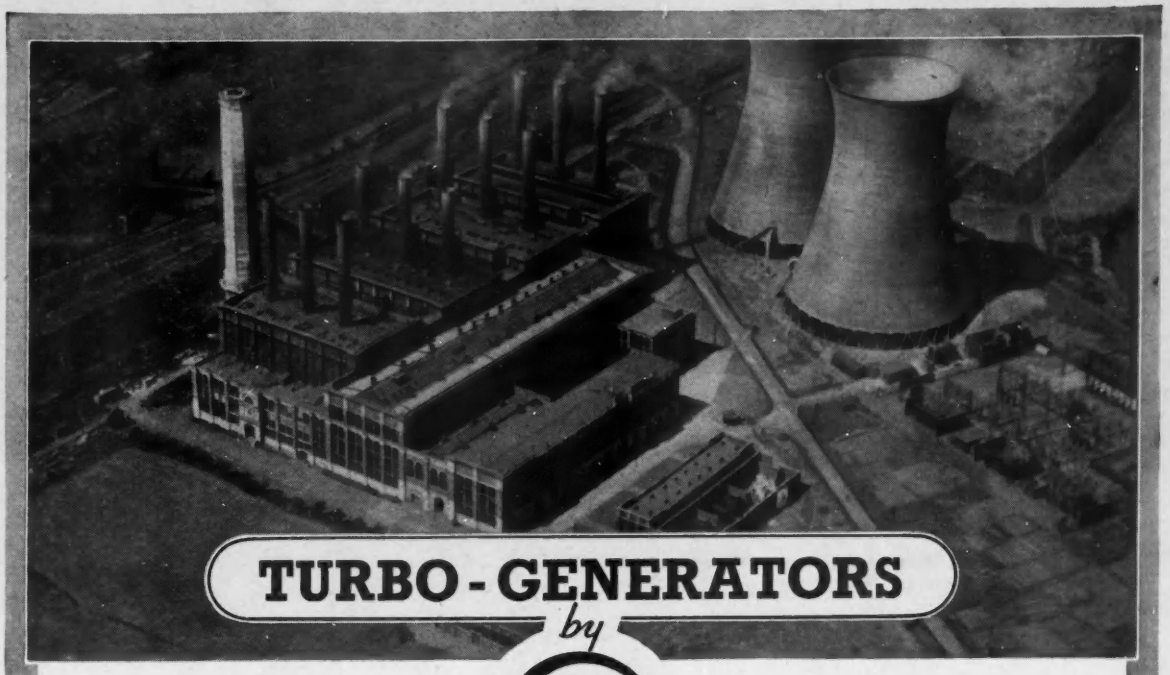

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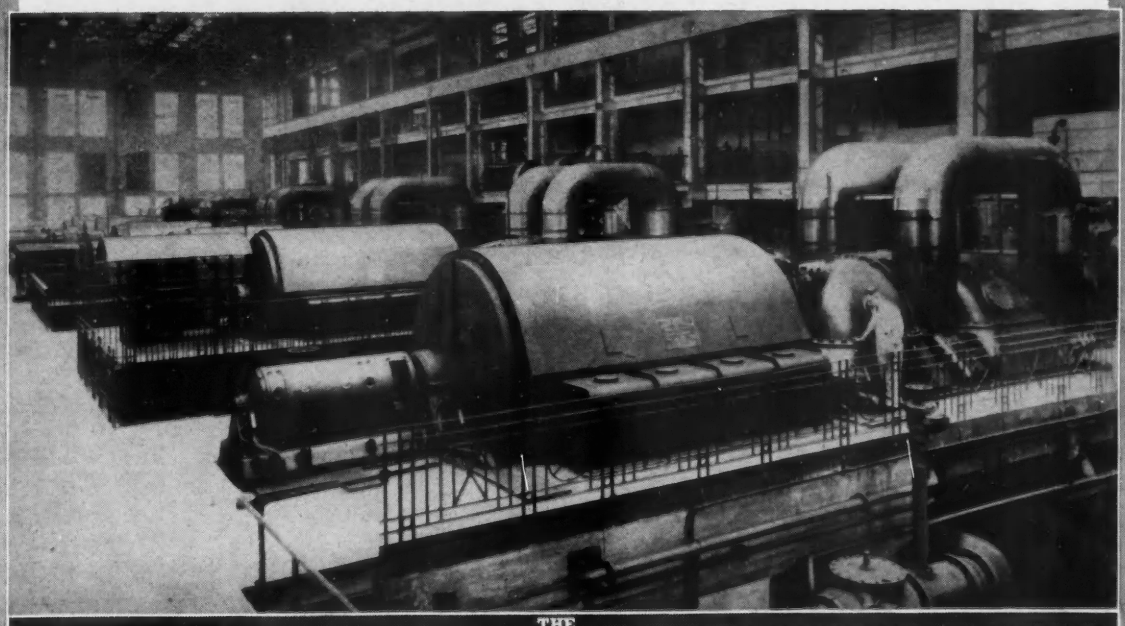

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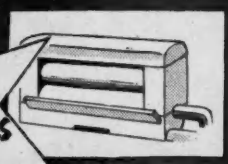

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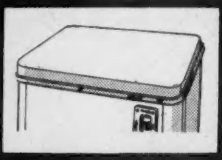
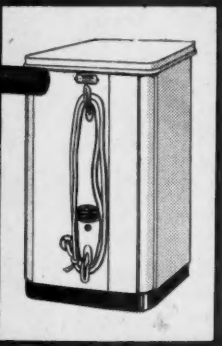


COOL TABLE TOP



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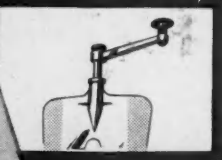

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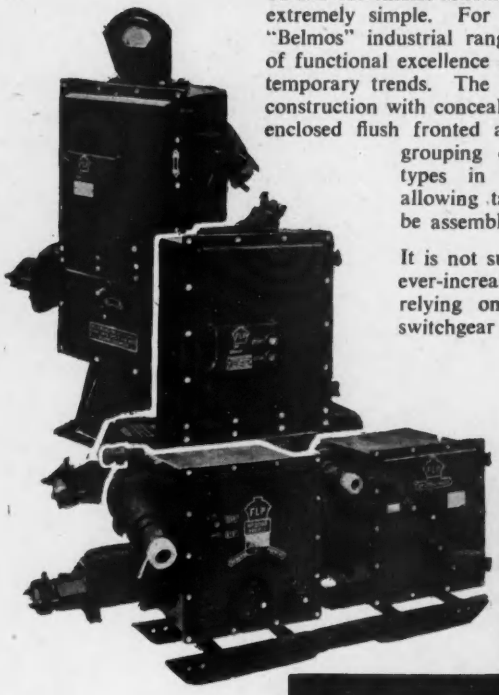

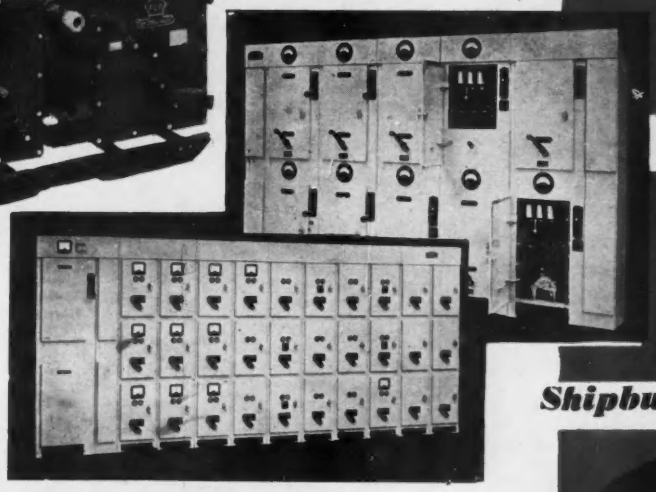

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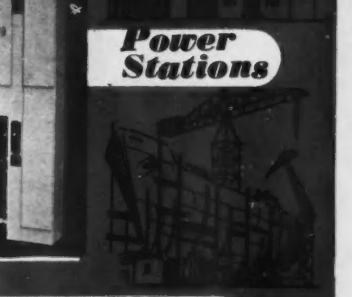

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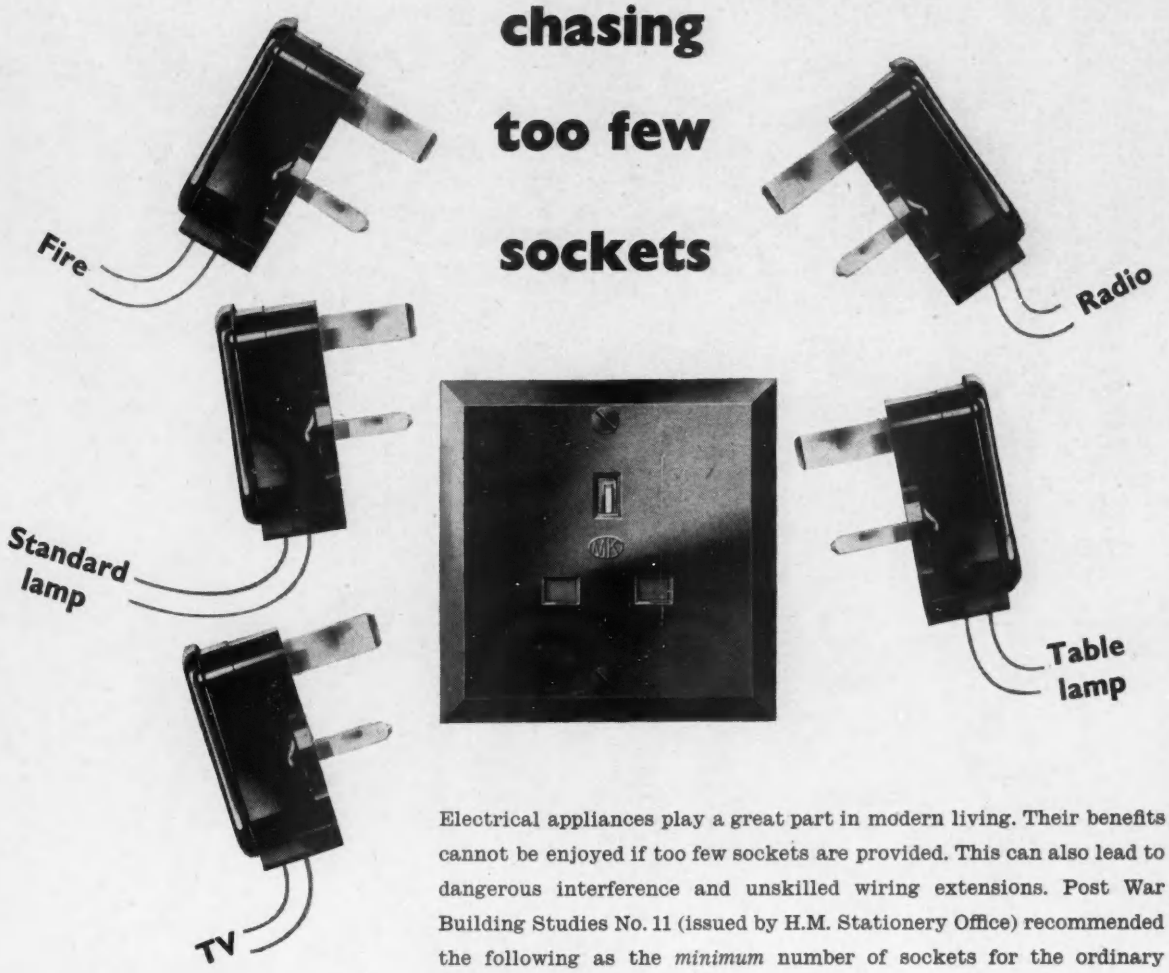

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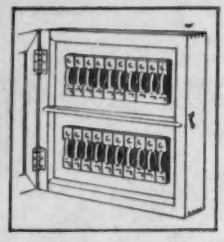
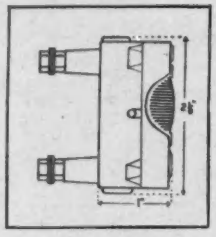


MINIMUM DIMENSIONS



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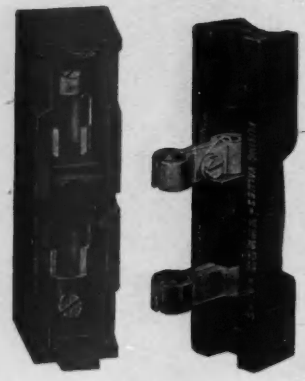

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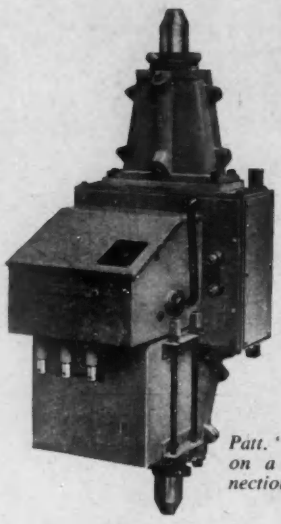

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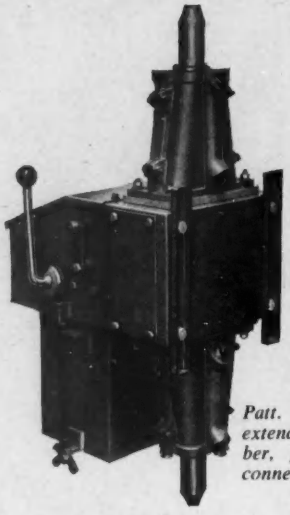

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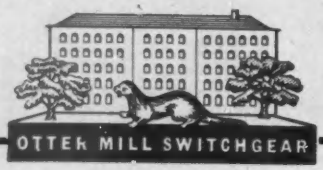

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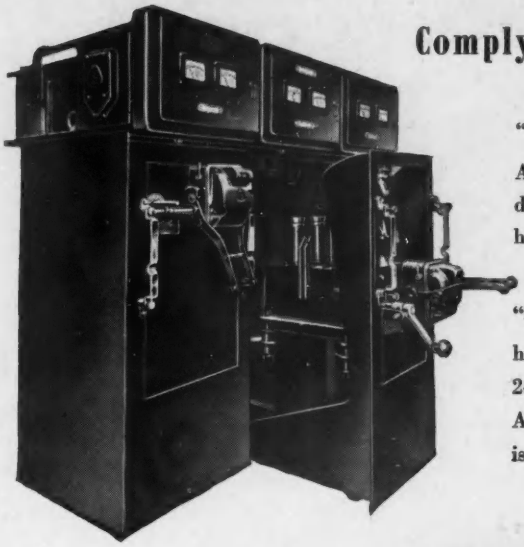

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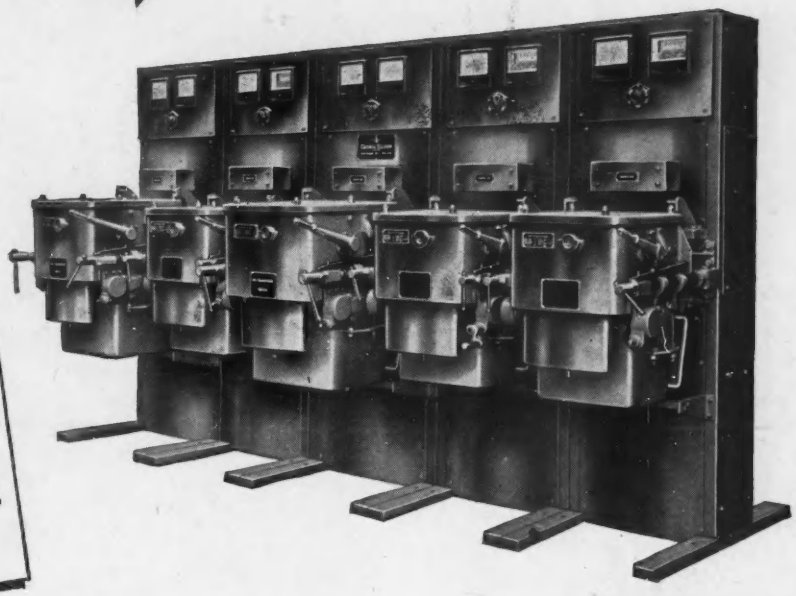

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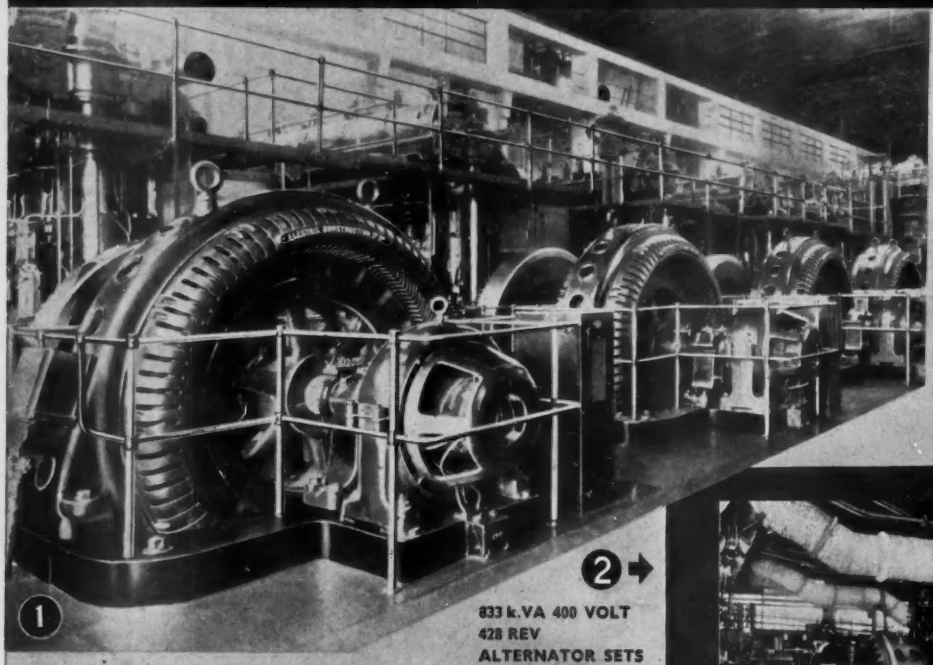

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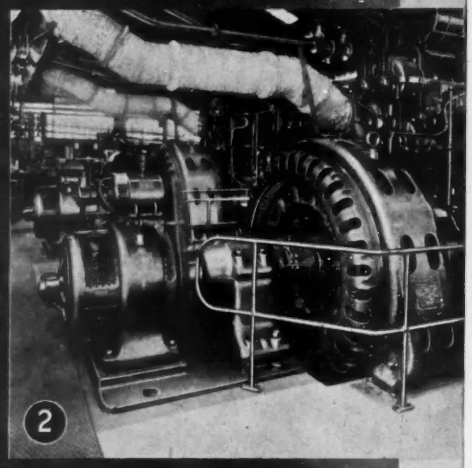

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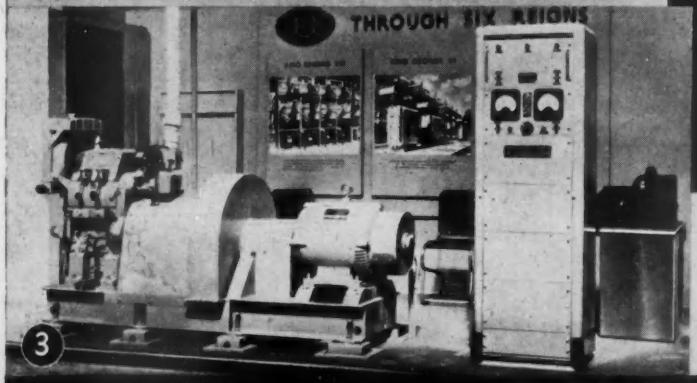

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In This Issue

Impedance of Earth Continuity Conductors, by *E. E. Hutchings*, B.SC.(Eng.), M.I.E.E. 841
Case for the B.E.A. 844
Contractors in Conference 845
Automatic Machine Tool Control 848
Mechanical Handling—The Quickest Way to cut down overheads 850
Auckland's Brighter Outlook 852
Switchgear Appearance and Unit Design ... 852
Eastbourne Preview—B.E.P.C., 1954 ... 855
From an Engineer's Notebook 867
Extruded Aluminium Sheaths for Power Cables 868
Overseas News 870
Personalities in the Industry 872
Wire Factory Moves to Bracknell 873
Equipment for Industry 874
For the Electrical Trade 875
Problems and Practice in Engineering ... 876
News of the Week 877
Questions in Parliament 881
Electric Supply News 881
Company Activities 882
Commercial Information 883
Classified Advertisements 63
Index to Advertisers 68

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HYDRO OR ATOMIC POWER

With atomic power likely to emerge as a commercial force in some ten years' time, it behoves us to commence thinking of what impact it is likely to have on generating plant programmes. As far as steam stations are concerned the position is relatively simple. There is little reason to believe that the rate of building atomic stations will be significantly greater than the present plant programme and in consequence new projected steam stations can safely be expected to live out their full economic life despite the advent of atomic energy. With hydro stations, where repayment of cost extends over a much longer period a different set of factors applies and the question has been raised whether the launching of such projects is wise under present conditions. The difficulty of assessment lies in the very nebulous estimates of atomic power costs, but as the most optimistic of forecasts place these in the same order as steam station costs, hydro stations should be able to more than hold their own. Particularly so since the gradual fall in value of money will lead to higher capital costs for atomic stations when they come to be erected, than the estimates based on present values. Unquestionably the right course is severely to restrict any influence of possible atomic power generation on present plant programmes, for the first commercial station will almost certainly be followed by a period of development in design which should allow reasonable time for critical decisions on policy to be taken.

CONTRACTORS TO BOOST THE LOAD

Naturally enough it is the area boards that do most of the talking about load building, since theirs is the prime concern. Seldom is the electrical contractor mentioned in this connection, in consequence the contractors' own ideas on the part they might play in such activities takes on a special interest. To judge by the views expressed at their Harrogate conference last week, sentiments are mixed. Varied experience of competition offered by nationalised electricity has made some contractors wary of co-operating with the electricity boards in any respect. Those who favour participation of contractors in the load building effort, however, seem to offer stronger arguments than their more cautious colleagues. They are confident that they can give the public a service additional to that of the electricity boards, and they see that aggressive load building, especially the full use of attractively organised showrooms which this entails, can have the important auxiliary effect of keeping the contractor's name before his prospective customers. As one speaker suggested, perhaps with only slight

exaggeration, without such enterprise, there is a danger of the private contractor becoming as extinct in the domestic field as the independent gas fitter. There is, moreover, a wider view that supports this optimistic opinion. All sections of the industry will benefit as domestic demand grows, but such growth will not proceed at its maximum rate unless and until the whole industry, supply, contractors and manufacturers, recover a common enthusiasm to sell electricity as an idea, as well as pushing their own contributions to the electrical whole. And that means active load building by everyone.

UNHOLY ALLIANCE

The Bill to increase the borrowing powers of the B.E.A., presented to Parliament last week, has been long expected, but its nature was something of a surprise. Electricity is joined with gas in this claim for increased capital and since this Bill is of the single clause type, economy of legislative time is obtained thereby. This joining of the two nationalised industries may also have the advantage of dispersing the attack on the current level of capital expenditure, for such an attack will most surely come. The unifying of the industry's borrowing into one global amount, gives perhaps a total frightening to some, but basically the money is required to pay for plant to meet the demand resulting from far greater capital expenditure. The corresponding figures for America, to which we referred last week, should place the doubling of the B.E.A.'s borrowing powers in a proper perspective. With the intention of explaining the industry's point of view to M.P.s in particular and the public in general, the Central Authority is issuing a publication, "Power and Prosperity," which is reviewed on a later page. Whether this will succeed in softening criticism from die-hard opponents, remains to be seen.

CONDUIT COMPROMISE

Since the twelfth edition of I.E.E. Wiring Regulations appeared, contractors have been troubled by the requirement then introduced, that the impedance of the earth continuity conductor, rather than its resistance, should not exceed one ohm. Resistance is comparatively easily measured in any type of installation; in contrast, it has proved effectively impossible to determine the impedance in early stages of erection with the apparatus available to the average contactor. Indeed, there is some uncertainty about the meaning of "impedance" when related to a single conductor. With installations carried out in steel conduit, the situation is further complicated by the way in which magnetic properties vary with current, leaving the requirement as badly stated in the regulations without clear and single meaning. As usually happens, however, a practical approximation has been evolved which points the way out of these problems. Work at the E.R.A. has led to the conclusion, discussed in an article on a later page, that for most conduit installations resort may be had to the well-tried methods of resistance measurement, there being a generally applicable relationship between resistance and impedance in most practical cases. So far as it goes, this is satisfactory, but the experiments carried out have revealed that the "impedance" requirement has had the effect of dropping the permissible resistance from one ohm to between 0·2 and 0·4 ohm, depending on the precise nature of the installation. A tightening up of the requirements so drastic as this was not intended by those who drafted the twelfth edition, and some easement seems called for when the thirteenth edition is published. The suggestion that a resistance of 0·5 ohm should be accepted as a compromise, is one deserving of earnest consideration.

LIGHTS IN DAYLIGHT

The daylight appearance of street lighting schemes is something that rightly deserves consideration but we feel that the Council for the Preservation of Rural England, in their annual report, go too far in urging factors which may affect the standard of lighting in certain installations. In reviewing the height of the columns in relation to the surrounding buildings, they suggest that it may be desirable on aesthetic grounds to adopt "Group B" standard for heights in some trunk road installations where Group A is normally required. This is a dangerous argument to introduce at a time when our standards of lighting are still far too low and when greater uniformity of design throughout a length of road has become an urgent need. In similar mood, the C.P.R.E. deplore the use of concrete poles on aesthetic grounds. Such a conclusion may be right for a Tudor village, but with concrete as an essential material of contemporary architecture, surely this is far too sweeping. No one will question the wisdom of the C.P.R.E. in drawing the attention of local councils to the importance of daylight appearance of lighting installations but it is not a subject for arbitary judgments, particularly when the primary purpose is greater safety on the roads.

AUTOMATIC MACHINING

It would seem that we are only now beginning to see the extent to which electricity will be utilised for production in the future. So far, the use of electricity in factories has been largely a matter of providing the necessary power drives, but it is becoming clear that it will have an equally important part to play as a medium for production control. Occasionally we catch a glimpse of the possibilities of the future through some specific development, and this week we describe an important step forward in the design of the Ferranti system of machine-tool control. The ability to produce on an electronic computor, machine shop instructions in the form of magnetic tape and of a means of machine control which will follow out those instructions to the highest standard of accuracy is an outstanding advance in automatism. Since the introduction of the automatic lathe, continuing development has taken place to release skilled labour, leading to such developments as automatic belt production in which the part being machined passes from one machining head to another under automatic control. None of these methods, however, have the flexibility of the Ferranti system. The combination of precision graticules to ensure accuracy, with the convenience and speed of control of magnetic tape, is essentially adaptable to varying types of machine tools and systems of production. The high capital cost of the equipment must appear a severe deterrent to its widespread application but with the heavy capital value of machine tools today, any system that can save idle machine time and speed production becomes almost a necessity.

Impedance of Earth Continuity Conductors

PRACTICAL MEASUREMENTS ON ELECTRICAL INSTALLATIONS

By E. E. Hutchings, B.Sc.(Eng.), M.I.E.E.

PRIOR to 1934 the I.E.E. Wiring Regulations limited the resistance of conduits or sheathing between a point near the main switch and any other point of the completed installation to two ohms. In that year the permissible limit was reduced (in the 10th edition) to one ohm for earth-continuity conductors in general (including the earthing lead) from the connection with the earth electrode to any other position in the completed installation, and this provision remained in force in the following edition including its 1945 reprint.

With the issue of the 12th edition in 1950, a significant change is to be noted. The requirement was no longer that the earth-continuity conductor, as defined above, should not exceed 1 ohm in *resistance* but that its *electrical impedance* should not exceed that value.

The reasons for specifying an ohmic limit for earth-continuity conductors are two-fold. In the first place, as one part of the earth fault loop, these conductors contribute to the limitation of fault current on which the operation of the overload protection depends. In the second place, during the period of the fault the frame of the faulty appliance is raised to a potential above earth by the passage of the fault current through the earth-continuity conductor. An ohmic limit is therefore necessary for the avoidance of risk both from fire and from shock.

Why Impedance?

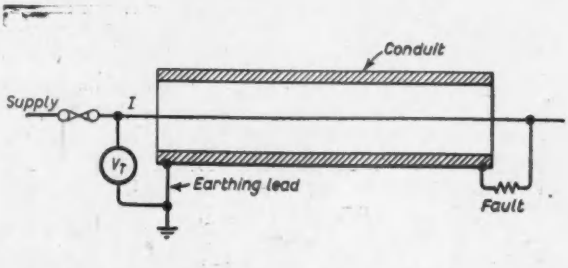
The vast majority of installations are now supplied from a.c. systems, and the impedance of the fault circuit is therefore the factor which determines the current which will flow. The change was introduced mainly, however, not for this reason but because extensive use of inductors or chokes in earth-continuity conductors for radio interference suppression was feared. In point of fact this method of suppression is not so effective as others nor is it desirable from other points of view; nevertheless the fact could not be overlooked that such chokes were available for connection in the earthing leads of portable appliances and their use might be extended to the fixed earth-continuity conductor in order to provide common suppression for groups of appliances, particularly in blocks of flats or commercial premises where a number of such appliances might require suppression. Chokes for this purpose might well have a low d.c. resistance and they would not therefore be detected by a resistance measurement; their contribution to the a.c. impedance and their consequent effect in limiting earth fault current could, however, be serious and might lead to ineffective earthing if protection depended on the operation of devices of the overload type, e.g. fuses.

Measurement Difficulties

The change had implications which were not, at the time it was made, fully realised. In the first place, electricians who were familiar with resistance measurements might be neither so familiar with impedance measurements nor equipped with the necessary instruments to make them. Furthermore, although one can specify the resistance of a single conductor, its impedance has no meaning except in relation to the circuit of which it forms a part. Finally, as will appear later, results of impedance measurements will depend on the test current if they are made on circuits which include steel conduit.

No difficulty arises in the case of cables incorporating a separate earthing conductor. The non-magnetic nature of the conductors and the small separation between them results in a practically non-inductive loop whose impedance at any test current is approximately equal to its d.c. resistance, and a measurement of the latter is therefore sufficient if allowance is made for the resistance of the return conductor. The same conclusion applies to a circuit comprising single-core cables with an earth-continuity conductor in the form of a separate bare or insulated copper lead bunched with the phase conductors, or one in which the wiring is run in non-magnetic conduit (aluminium, aluminium alloy or copper) or is carried out in lead-sheathed cable or Pyrotenax.

The case of installations carried out in steel conduit, however, demands careful consideration as there are several impedances concerned.[1]



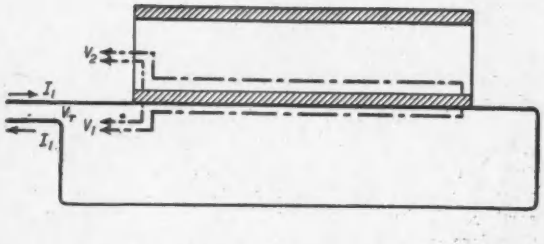


Fig. 1. Current path for the normal fault condition occurring with a sound installation and Fig. 2 Currents and voltages when impedance is measured before cables are drawn into conduit. The curves in Fig. 3 refer to these diagrams

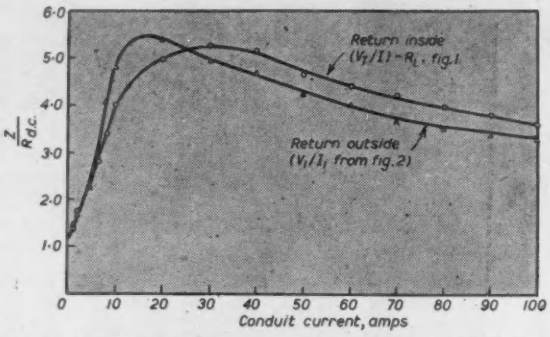


Fig. 3. Comparison of inside and outside impedance of one inch heavy-gauge conduit at different values of current

Steel Conduit Installations

As with any other circuit consisting of a "go" and "return" conductor, the circuit impedance is the sum of the self-impedances of the two separate conductors and twice their mutual impedance. The circuit impedance is the only one of these which can be readily measured outside a laboratory.

In the measurement of self and mutual impedances, it is difficult to ensure that the voltage between two widely separated ends of a single conductor is due only to the current flowing in that conductor and is not influenced by the current in the return conductor. Moreover, special precautions are necessary in running the potential leads to measure that voltage to avoid induction in those leads by the currents flowing in one or both of the circuit conductors. The potential lead to the end of the conduit remote from that at which the voltage measurement is made must be run close to the surface of the tube; outside it if the return of the current loop is an external conductor and inside it if the current returns by a conductor within the tube. To avoid disturbance of the current distribution in the tube itself by proximity effects, the return conductor should in the former case be widely separated from the conduit and in the latter case it should run along the axis of the tube. It is clear that these conditions would be difficult to fulfil in carrying out a measurement on a practical installation with the equipment normally available. They can, however, be met in laboratory tests on experimental conduit runs.

For a normal earth fault on an appliance the fault current flows to the appliance through the phase conductor and returns through the conduit containing that conductor (Fig. 1). The contribution to the total impedance of the earth-fault path made by the earth-continuity conductor (conduit) and its associated line conductor is the impedance V_T/I measured between the connection of the earth-continuity conductor with the consumer's earth electrode or earthing terminal and the phase conductor at his supply terminals. The effective impedance of the earth-continuity conductor itself is then, to sufficient accuracy, the difference between the value so measured and the resistance (R_L) of the associated phase conductor; the latter can be estimated from its length and cross-section. The potential rise of the framework of the faulty appliance is the product of the fault current and the *mutual* impedance between the "internal" circuit consisting of the conduit and the phase conductor and an "external" circuit consisting of the conduit and a conductor external to it. This mutual impedance is always less than the effective impedance of the earth-continuity conductor determined as above; it is therefore safe to take the same measurement as applying to both the impedances concerned.

The measurement can best be made at any point in an installation by disconnecting the circuit lead supplying that point from the supply terminal and connecting it to the earthing terminal of the installation, then testing between circuit lead and earthing terminal of the appliance or socket-outlet. In new installations, however, the test is frequently made before the wiring is drawn in. This raises a further difficulty as an external return conductor must be used. The condition is then shown in Fig. 2. A measurement of the loop impedance made in this manner using the external conductor in place of the circuit conductor can, however, be very misleading unless the external conductor is made to follow closely the conduit run; the result will, however, always err on the high side as regards shock risk and will not be seriously in error as regards the impedance affecting the operation of overload protection.

Other fault conditions can arise in practice. A fault may develop between an appliance or a circuit conductor and earthed metalwork other than the conduit containing that circuit conductor. Thus the conductor of a flexible cord may, through faulty insulation, make contact with a water or gas pipe or structural steel-work and the earth loop may then be very large with a correspondingly high inductance. Again, in large installations with a number of conduits following the same route, the insulation of a conductor run in one conduit may fail to another conduit. Such conditions are generally, however, covered by compliance with the regulations or with sound practice in other respects; in the first example, bonding of other services to the conduit would secure the return of the fault current mainly through the conduit containing the conductor supplying the faulty circuit, and in the second bonding of all conduits at points where they are in proximity to one another would ensure reduction in impedance by the provision of parallel paths. A result complying with the regulations, if obtained from a measurement made as previously described, will in fact, unless the earthing system contravenes regulations or good practice in other respects, always ensure safety.

Value of Test Current

A further question which arises is the current at which the impedance of an earth-continuity conductor should be measured. From the point of view of fault clearance this should be the minimum current at which the circuit protection will operate. From the point of view of safety, it will be the maximum current which can be sustained without operation of that protection, which is the same thing. However, sub-circuits are often over-fused and it is preferable therefore to consider that the earth-continuity conductor may be required to carry the operating current of the main fuse or circuit-breaker.

In the case of copper or other non-ferrous earth-continuity conductors, the point is immaterial since impedance does not vary with current. Where steel conduit is concerned, however, the impedance-current characteristic depends on the conduit size, wall thickness, and type. In general, characteristics are similar whether the measurements are made with the return conductor inside or out-

TABLE I.—Measured and Calculated Impedance, of Steel Conduit. (The impedance concerned is V_1/I_1, Fig. 2.)

Conduit	Impedance/D.C. Resistance		
	Measured		Calculated
	Sample 1	Sample 2	
⅜" light	3·0	2·3	2·3
½" light	2·7	—	2·8
½" heavy	2·9	—	4·3
1" heavy	4·1	5·4	4·4

TABLE II.—Ratio n=Maximum Impedance/D.C. Resistance for Various Types of Earth-Continuity Conductor. (Values are Given Approximately as Suitable for General Use.)

Type of Earth Continuity Conductor		Ratio n
Circular Steel Conduit (welded or solid drawn)	Wall Thickness/Outside Diameter	
	0·18	5
	0·10	4
	0·05	3
Split steel conduit		1·15
Any non-ferrous conductors		1·0

side the tube (Fig. 3). Curves for a number of different conduits using the latter arrangement are shown in Fig. 4. The impedance of the split conduit, as would be expected, varies little from its d.c. resistance as it provides no closed magnetic circuit. The remaining curves rise to a maximum value with increasing current and then fall due to saturation effects. The significant feature of them all is that the peak occurs in the range 15-40 amps, and that it is not very sharply defined. Thus a measurement made at 20 amps will give a sufficiently accurate result and it is unnecessary to use a higher current for testing, even if the conduit may have to sustain a higher fault current. The ratios of effective impedances of conduits to their d.c. resistance observed in laboratory tests shown in Table I which are in reasonable agreement with theoretical calculations, lead to an important practical conclusion. Neglecting "freak" fault conditions referred to previously, which should not arise in good installation practice, these ratios lie generally within the range 2·5 to 5. In order to comply with the impedance limit of 1 ohm laid down in the Regulations, the d.c. resistance of a steel conduit installation should therefore not exceed 0·2 to 0·4 of an ohm according to the type of conduit as shown in Table II. Now, as has already been pointed out, difficulty will often be found in obtaining a valid result from an initial a.c. test on an installation before the wires are drawn in. A d.c. test to ensure that the resistance of the conduit run does not exceed the above value is, however, simple. It has, moreover, a further advantage.

D.C. Measurements

It has been found[2] that the d.c. resistance of an imperfectly made conduit joint (or indeed of any imperfect joint between two metal surfaces) varies with the current at which it is measured. The nature of the variation may differ—in some cases the resistance increases as the test current is raised, in others it decreases, and the change may or may not be permanent. The effects are complex and arise from the nature of the contact between the surfaces. This fact leads to a simple method for proving the quality of the installation. If the d.c. resistance is measured first at a low current (up to 100 mA), then at a higher current (say 10 amps), and then again at the lower current, the values obtained will be the same if the joints are sound, apart from a possible slight variation due to temperature coefficient. If, however, the three results vary appreciably in any way (say by more than 25%) it may be taken as evidence of a faulty joint or joints which should be located and rectified while the installation is new (as can often be done at that stage and not later), since such joints, while they may not cause the resistance of the run as a whole when new to exceed the permissible limit, are a potential danger as they are liable to increase in resistance with age.

From what has been said earlier, it is clear that for the limitation of 1 ohm on the resistance of earth-continuity conductors, many installations must have been operating with an earth-continuity conductor impedance of 2 ohms or more, and there is no evidence to suggest that this has had serious consequences. Limitation to 0·2—0·4 of an ohm resistance, as is necessary according to the experimental evidence if the impedance is not to exceed 1 ohm, therefore represents a considerable improvement on past practice and the adoption as a general limit of the upper of these values or even a slightly higher value still (say ½ ohm) irrespective of the type of earth-continuity conductor, might well be considered as a reasonable compromise. Such a value of resistance would correspond to an upper limit of impedance of 2·5 ohms except in special circumstances which should not normally arise.

Nevertheless it can be advocated that good practice demands careful testing by the best available methods, especially in large installations, to ensure that the existing regulations are fully met. This can be interpreted as requiring the application of the factors tabulated to results obtained by a d.c. test on the initial installation and subsequent a.c. testing at a current sufficient to ensure that the maximum impedance does not exceed the specified limit.

Conclusions

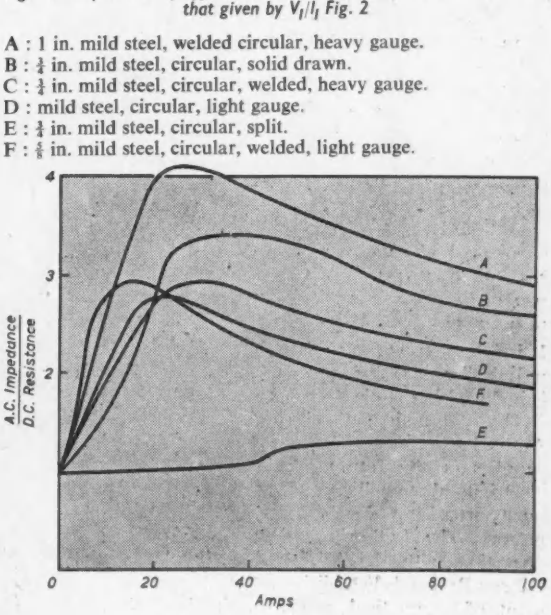
To sum up, the following procedure is recommended for determining the impedance of earth-continuity conductors.

(1) On a new installation (before drawing the wire into conduits) the d.c. resistance should be measured using the "low-high-low" technique. The result should not exceed the values tabulated according to the type of earth-continuity conductor. An earth-continuity tester incorporating a hand-driven generator is suitable for the low current test. A battery-operated ohm-meter is suitable for the high current test, and, if provided with a double range, for both tests.

(2) After drawing in the conductors, and periodically during the life of the installation, an a.c. impedance measurement should preferably be made, using the methods advocated. Mains-operated sets giving a test current of 15-20 amps are available and are suitable. If the test

Fig. 4. Impedance of typical conduits. The impedance measured is that given by V_1/I_1 Fig. 2

A : 1 in. mild steel, welded circular, heavy gauge.
B : ¾ in. mild steel, circular, solid drawn.
C : ¾ in. mild steel, circular, welded, heavy gauge.
D : mild steel, circular, light gauge.
E : ¾ in. mild steel, circular, split.
F : ⅝ in. mild steel, circular, welded, light gauge.



current is limited to a lower value (say 5 amps or less), the result should not exceed the values allowed for the d.c. test. Such a test will take account of the impedance of any choke which may be inserted in the earth-continuity conductor. If it is not made the absence of such chokes must be verified by inspection.

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Case for the B.E.A.

Booklet on Supply Progress Synchronises with Borrowing Bill

PUBLISHED on Tuesday of this week, by the British Electricity Authority was a booklet "Power and Prosperity" which provides a comprehensive picture of the past development, present situation and future prospects of electrical energy in Great Britain. The first two sections of the book are devoted to a brief review of existing and past legislation, and a summary of progress in recent years (1920-1953). This second chapter gives details of the increase in sales to various classes of consumer, and some information on the growth of generating capacity and the improvement in thermal efficiency of generation. In this connection it is pointed out that with 60 MW sets operating at 900 lb/sq in., 900° F, overall thermal efficiencies of 28% can be expected—with a maximum efficiency unded optimum test conditions of 30·5%. However, when the 100 MW units (1,500 lb/sq in., 1,050° F) and the 100-120 MW reheat sets (1,500 lb/sq in., 1,000° F) come into operation figures of 30 to 33% should be possible. In their estimate of probable conditions in 1960-1, the Authority estimates that the overall average thermal efficiency should be in the region of 26% (sent out) as compared with 22·72% for 1953. Information is also included, in this second chapter, on the "Supergrid," distribution, rural electrification, and research.

Looking Ahead

While much of the information given in the earlier sections of the booklet is common knowledge—at least to those connected with the industry—the third chaper, "Looking Ahead" may prove of greater interest, as it gives the basis on which estimates of future load have been founded. It is expected that during the period 1953 to 1960 the maximum demand for electricity will increase by over 40% and that the unit requirements by 1960 will be almost half as much again as at the beginning of the period. These estimates are, of course, liable to be affected by any severe change in economic conditions.

Although the foreseen demand can be estimated, the plant that can be installed to meet it, is governed by manufacturing capacity available and limitations imposed by the Government for economic reasons. A total capacity of 9,600 MW has already been sanctioned by the Government for commissioning over the period 1954-1959, although the B.E.A. have asked for an extra 200 MW to be included in the 1959 programme to bring the figure up to 9,800 MW. It is interesting to note that designs for 200 MW sets and unit boilers are being prepared and a unit of this size is included in the plant programme for 1959.

The production of electricity requires fuel, and the Authority is concerned about the probable position of coal supplies in the future. In 1960, coal requirements for electricity alone will amount to about 50 million tons. The most promising development in fuel supply is nuclear power. The Authority welcomed the opportunity of co-operating with the Ministry of Supply, at the Atomic Energy Research Establishment at Harwell, on the development of a practical power production scheme, and are continuing this co-operation with the Atomic Energy Production Division at Risley in connection with the Calder Hall station. It is hoped that within the next few years it will be possible to build a large atomic power station, employing 60 MW sets, and the Authority hope that they may shortly be placed in a position themselves where they can design and construct such stations as part of their normal activities. There is good reason to believe that a significant contribution to the nation's power supply will be available from atomic energy within the next twenty years.

Information is also included in this section on the reasons for the Supergrid and on the possibilities of the cross-channel link. Little, if any, new information is, however, included in either of these sections.

Finance

In the financial years 1953/4 to 1959/60 inclusive the programmes of the B.E.A. are expected to involve a capital expenditure of some £1,421 millions. In addition, a larger volume of working capital will be required, and during this period, the Authority and area boards together will require an additional £21 millions, bringing the total to £1,442 millions. It would, of course, be quite impracticable for the industry to finance all these capital requirements, but it is expected that some £435 millions from internal resources can be found, leaving some £1,007 to be met by new borrowing. The actual "ceiling" imposed on borrowing does not reflect the total loan indebtedness of the Authority, for while it is estimated that new borrowing from Vesing Day to March 31, 1960, will amount to £1,500 millions, the net indebtedness will have increased by £1,236 millions (from £554 millions at Vesting Day, to £1,790 millions at 31st March, 1960). The difference of £264 millions represents £145 millions applied or to be applied in redemption of local authority and other transferred mortgage loans, £19 millions in repayment of inherited bank overdrafts, £1 million in redemption of a small amount of British Electricity Stock, and £99 for the purchase of stock redemption fund account investiments.

The booklet concludes by stating that it would be unwise to attempt to forecast with any degree of precision the effect on electricity charges of the expenditure which it will be necessary to incur on new capital works up to 1960 as so much depends on the future levels of consumption, prices for plant, equipment and materials; rates of interest, wage and salary levels and improved efficiencies. The high cost of new plant and equipment, which is about three times as great as before the war is bound to have the effect of increasing the relative burden of interest and depreciation charges. This can only be offset by improvements in thermal efficiency and in the load factor. The electricity supply industry must, therefore, be free to encourage increased consumption—and to have the necessary resources for the purpose—with a view to making the most effective use of generating capacity.

Contractors in Conference

PRESIDENT CALLS FOR IMPROVEMENTS IN THE PRODUCTIVITY OF THE INDUSTRY

MEMBERS of the E.C.A. made good use of their annual conference, held at Harrogate last week. Discussions were lively and helpful at the public sessions, and from all reports even more so at the well-attended Annual General Meeting which was held in private on Wednesday. For its success the Conference owes much to the urbane chairmanship of Mr S. L. M. Barlow, the retiring president, who opened the business proceedings on Tuesday with his presidential address.

Presidential Address

Mr S. L. M. Barlow began his address by referring to the preceding twelve months as one of the most important periods that the Association has experienced. It had been a testing time for the membership's loyalty and strength, and they had emerged stronger, more united, and with the realisation that they must keep together even closer in the future. But the main part of his address, in keeping with the custom of the Association, was concerned with the future rather than the past.

In this connection, he suggested that it was encouraging to note that electrical contracting was increasingly developing as an export trade, as well as adding to its records of achievement at home. More help was needed from the Government, however, in the form of lower taxation. In particular, it was to be deplored that the Government, in reducing rates of purchase tax, had not honoured the undertakings given when the tax was first introduced. When reductions occurred, the retailer should be compensated for the tax paid that was not recoverable.

One lesson to be learned from the technical advances of recent years was that the time was long past when the separate sections of the electrical industry could work in watertight compartments. The President said that he would strongly advocate all members seeking greater collaboration with electrical manufacturers in developing and installing new and improved methods of utilising electricity. In particular, there was a need for close attention to be given to the advances being made in electronics. Another field deserving consideration was air conditioning, for this seemed a natural development of the attention now being given to better thermal insulation for buildings.

In the technical field, the Association, through its technical committee, had made detailed recommendations to the I.E.E. for the revision of the wiring regulations for a 13th edition. It was likely that this would be so arranged that there would be one section devoted solely to the standards which an installation should reach for connection to the public supply mains. This should help to free electrical contractors from the unjustified burden they had suffered due to different interpretations of the rules by supply authorities up and down the country.

Unfortunately, in the President's view, there still seemed no solution in sight concerning unauthorised extensions to electrical installations. He considered that the only solution would be provided by compulsory registration of the electrical contractor and the electrical operative, with prohibition of unregistered persons interfering with existing installations. In connection with safety generally, it seemed to him that electricity supply authorities should help by always providing an earth terminal at the service position.

Concerning the place of electrical contracting in the electrical industry as a whole, it was possible to record that the B.E.A. and the area boards were showing an increasing recognition of the fact that the contractors were not afraid of competition, and goodwill between these sections of the industry had improved. In a wider sphere, however, there was need for a greater appreciation of the increasing part that specialists had to play in modern building construction. It was to be deplored that specialist trades were not represented on the committee which recently issued a report on selective tendering. The report itself was extremely disappointing, and omitted many examples of inefficient and uneconomic tendering practices.

Turning to the question of relations with the E.T.U., Mr Barlow suggested that productivity in the industry was only 70% of what it was prior to the second world war. It was certainly lagging behind that in many other countries. A change in heart and a return to pride in craft were urgently needed. This could only be achieved by better understanding between employer and operative. In wage negotiations the time was long past where any employer's association could neglect the nation's economy. This was a basic reason for referring wage claims to arbitration. Any increases granted had to be passed on to the public, and it was felt that a Government appointed tribunal could better take responsibility for such a decision than the N.F.E.A. For the employee's side to ignore arbitration as a means of settling a dispute seemed to abandon a basic principle of British justice.

Finally, the President referred to trading matters. He felt that the Association's representatives on the Fair Trading Council had recently made progress in securing recognition by other sections of the industry of the need to give attention to many matters which had been concerning electrical contractors. Not the least important of these was the question of recognised users and special large buyers.

Business Opportunities

The first of the conference papers, which was presented immediately after the Presidential address, bears the promising title "Business Opportunities for Electrical Contractors." Mr J. R. Halliwell, a vice-president of the E.C.A., is the author, and in his introduction he stresses that there is no intention to minimise what contractors have already done to further their activities, but rather to stimulate interest in further opportunities.

The keynote of the paper is service, for to give service is, in Mr Halliwell's view, the electrical contractor's privilege and obligation. It affords him his greatest opportunity irrespective of any specialisation he may undertake. But the old and misleading designation of "wiring contractor" has to be fought against. If the electrical contractor has a sound knowledge of the primary principles of electrical engineering there are many avenues he may explore in search of remunerative work. It is, however, quite useless to sit around and wait for something to turn up. Opportunities must be sought with an exercise of the imagination.

The specialist opportunities which occur to contractors are necessarily conditioned by the industries which characterise their district of operation. In general, therefore, the paper confines itself to potential sources of business that are likely to be common to all areas.

One of these is connected with domestic load building. Discussions are taking place in most districts to facilitate co-operation between contractors and electricity boards in the installation of electric cookers, and there is a possibility that this principle will in the future be extended to cover water heaters. The contractor himself may help by pushing appliances that have desirable load characteristics, an example being thermal storage heaters. The contractor also has a part to play in helping the consumer get the best from the tariffs on which he is charged. Power factor correction at once comes to mind, and Mr Halliwell devotes considerable space to it. In this field the contractor can offer unbiased advice, which manufacturers of one particular type of corrective gear, such as capacitors, are not really in the position to do. But in discussing p.f. correction with customers, it is most important to have all the necessary figures available, so that the customer can be fully convinced that the necessary equipment is financially worth his while.

In the last few years much has been said about the importance of electronics to the contractor and this is supported in the paper. The point to be strongly emphasised, however, is the necessity for a careful study of any equipment installed. Without this, no satisfactory after-sales service will be possible.

If the contractor is to extend his interests, the possession of some form of workshop appears essential. Once it is available, it may be used to extend business even in a non-electrical direction. In particular, however, it offers opportunities for carrying out motor rewinds and the fabrication of switchboards.

Perhaps one of the least explored fields of electrical contracting is in connection with exhibitions. Work of this kind repays quite handsomely as a rule, but it calls on the contractor to assume a considerable responsibility. It is necessary to pay close attention to the safety rules of local authorities applying in various parts of the country, and to the trade practices concerning stand wiring. It is often found that the exhibition organiser wishes to be relieved of all responsibility for the electrical side of his exhibition. He wants to be able to issue to stand holders schedule rates inclusive of the energy used. In this case the contractor has to estimate the probable current consumption of the various stands, but this need not be too much of a gamble once experience has been obtained.

Mr Halliwell's paper gave rise to a vigorous discussion which for reasons of space can only be briefly summarised. Mr Joseph (Wolverhampton) felt that motor repair and rewinding should be undertaken only if ample facilities exist for mechanical as well as electrical work. Good handling and transport facilities and first rate technical knowledge are required. Mr H. S. Wathes (Leicester) stressed the possibilities for contractors in the present push for rural electrification. Mr A. Redvers Pratt, on the other hand, warned against too much co-operation with the electricity boards on load building: he thought their contracting departments would take the best jobs. He called for a boycott of manufacturers and wholesalers selling directly to the public.

Mr H. F. Truman (Walsall) felt that the contractor should offer a 24-hour service. He went on to say that the contractor must ensure that he is amongst the first to be consulted when a building is being planned. Mr F. W. Blanshard (Purley) in the course of a lengthy contribution, doubted whether a workshop was always worth while. Mr T. W. Heather (G.E.C.) stressed the importance of the whole electrical industry of developments in semi-conductors. From Mr R. Cussins (York) came a plea for efficient showrooms to fight the electricity boards and sell household appliances. Mr V. J. Stock (London) came down heavily against the contractor's workshop. Finally, Mr Ernest Long (B.E.A.) made an amiable contribution of goodwill, being greeted as a "Daniel in the Lion's den."

Lighting Prospects

The second paper presented to the Conference is the joint work of Messrs A. H. Olsen, B.SC., A.C.G.I., M.I.E.E., and C. J. Veness, ASSOCIATE I.E.E., and it takes the form of an extensive discussion of lighting in all its aspects. Shop lighting provides a starting point, with a reminder that there were 531,143 retail establishments in England alone, 60% having turnovers of £10,000 or less. Potentially these represent much business if they can be persuaded to increase their lighting levels. Techniques for both window and indoor lighting are discussed, and the authors suggest that in the latter case about 20 lumens/sq ft is the average illumination to be aimed at. In all cases, the electrical contractor will have to "sell" the possibilities of lighting to the shopkeeper.

Offices are taken next, with a reminder that constant research has shown that more and better work can be done in offices under high levels of illumination, and figures in the neighbourhood of 20 lumens/sq ft are now sought. It may be necessary for the contractor, in advising his client on office lighting, to make suggestions about the decorations as well, if the best is to be got out of a scheme. Often merely painting the ceilings can increase lighting levels at the working plane by up to 25%. In anticipation of complaints if fluorescent lighting is introduced, it is worth remembering that a good deal of medical research has shown that complaints of this type of lighting causing eye strain are unfounded.

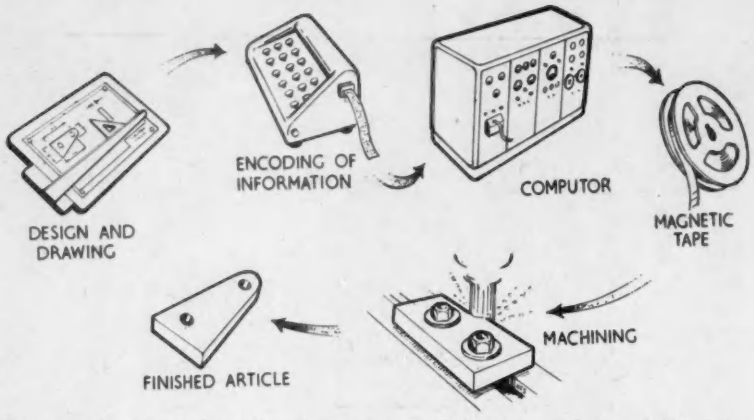
When industrial lighting comes to be considered "the law is on our side"—the Factories Acts take account of the need for "sufficient and suitable" lighting. For a small factory presenting no difficulties in the way of mounting height and harsh shadows, 15 lumens/sq ft can be provided at 1s. 3d./sq ft for tungsten lighting and 3s. 3d./sq ft for fluorescent. If the wiring exists, tungsten can be converted to fluorescent for about 2s. 4d./sq ft. It has to be remembered—and the factory management reminded—that such schemes are chargeable for tax purposes. In planning an industrial scheme, it is worthwhile giving considerable thought to switching arrangements.

Finally the authors touch on home lighting. An interesting suggestion here is that every showroom should have a complete library of all lighting manufacturers' current catalogues, supplemented by current magazines that have space devoted to lighting matters. People like to browse through such magazines, and the ideas they obtain often lead to worthwhile sales. On home lighting generally, the authors contend that the use of fluorescent lamps as a source of indirect lighting is the largest undeveloped market. This can be most effective in a functional role.

When the lamps are installed, they are too often neglected. Contractors can do much to rectify this, with advantage to themselves, by pressing upon factory and shop owners well organised cleaning and maintenance schemes. The contractor can offer terms for such a service often far below that of directly employed labour. For a replacement and cleaning contract, with a fluorescent installation of a normal size, 15 to 20% of the total value of fittings plus cost of installation is a representative annual figure.

1, Messrs S. Dickinson and E. Long chat together. 2, Mr L. C. Penwill in conversation with Mr and Mrs A. English. 3, Mr S. Watkins and lady. 4, The President and Mrs S. L. M. Barlow with The Mayor and Mayoress of Harrogate. 5, Messrs G. N. Walker and F. A. Croft of Birmingham with their ladies. 6, The authors of the lighting paper, Messrs C. J. Veness and A. H. Olson. 7, Mr A. S. Redvers Pratt and Mr E. Brown. 8, Mr R. A. Joseph of Wolverhampton opens the discussion on Tuesday. 9, A happy group of Association officers; Messrs J. Halliwell, R. Marryatt, W. Trace and A. V. Milton. 10, A North-East Coast party, Messrs A. S. Lowrey, J. Gibson, T. E. Dellow and V. Ferens. 11, Messrs J. R. Soans and H. S. Wathes with their ladies. 12, Messrs H. V. Newton, E. V. Brown, V. Coupland, H. W. Miller, and T. A. Garness

Automatic Machine Tool Control



The system; from drawing board, through computor to machine tool accurately controlled by grating

TECHNIQUES of mass-production, are well established and universally accepted. There are, however, industries where production quantities are so low that the heavy initial costs of mass-production cannot be carried, yet at the same time the requirement of component interchangeability is vitally important. Manufacture of these items must perforce be carried out by the use of expensive jigs and fixtures, representing considerable expense and by the employment of skilled labour. A similar situation arises when "tooling up" for a mass-production line when large and expensive tools may have to be cut from the solid, a costly and time consuming process.

The Problem

The main problem confronting the manufacturer is, therefore, how to produce precision made items using the minimum amount of skilled labour, but at the same time utilising to the maximum the capability of the machine tools involved. Ferranti Research Laboratories, therefore, initiated a programme of work in July 1952 under the direction of Mr D. T. N. Williamson directed toward the solution of this problem. At the outset it became obvious that the reason for the high cost of prototype manufacture was the use of highly-skilled labour in an inefficient manner. For instance a man using a milling machine on a job similar to die-sinking cannot possibly think fast enough to utilise the machine at a level remotely near to its peak capability. Much time is spent in altering the position of the work or the set up of the machine in order to deal with contours such as radii which cannot readily be expressed in x or y co-ordinates but require the use of circular tables.

Thus machine tools are not used at maximum capability due to the human element controlling them, and much time is spent in reading and interpreting drawings and then transferring the data into the feeds of the machine. It thus appeared that much of the thinking could be done much better by a machine, provided that a system could be devised which would maintain high accuracy, flexibility to permit the same machine to tackle diverse problems and rapidity in operation.

Ferranti System

With modern techniques of computation and control such a process is entirely feasible. The system can be divided into three stages. First the drawing information must be encoded on to punched tape along with other machining data; second the translation, by a digital computor of the information on the tape into a form acceptable by the machine tool (in this case a magnetic tape) and third the actual control of the movement and operation of the machine tool by the magnetic tape.

The drawing is prepared in a normal manner, except that all dimensions are taken from datum lines and co-ordinate references are given of all points of change (i.e. where a straight line joins a radius and so on). From the draughtsman the drawing goes to a planner whose function is to know the capabilities of the machine tool, and how the article should be machined. He transfers the metric information of the drawing, in correct sequence, to the punched tape, through a device like a typewriter, and includes in the drawing data various other factors, which he himself supplies, concerning cutter radius, feed rates, tool rotational speed and so forth. In order to maintain flexibility it is important that the information given to the machine should be as simple as possible. For example, in Fig. 2 the x and y conditions of A.B.C.D. from some datum would be given. In between each point the type of curve would be specified, such as AB=straight line, BC=circle with centre E, CD=straight line, DA=straight line. No co-ordinate information need be given between points which can be specified by an equation or the parameters of a curve. The types of curve which may be covered, are incidentally, only limited by the complexity of the computor, but for normal engineering purposes it is expected that a computor able to contour any curve of the second degree (circle, ellipse, parabola and hyperbola) will suffice. In the aircraft industry, however, it may be necessary, for aerofoil surfaces, to deal with equations of the fourth degree.

Although the drawing (Fig. 2) shows a two dimensional machining problem, there is, of course, no difficulty in extending the system to three dimensions.

The Computor

The task of the computor is to take the information from the punched tape and to fill in the gaps between the co-odinates given. Controlled by the equations of the curves specified, the computor issues information which controls continuously the path relative to the work, of the centre cutting tool in x y and z co-ordinates. The output in each co-ordinate is in the form of a train of pulses of variable rate, each pulse corresponding to a very small unit of movement, actually about one ten-thousandth of an inch. Thus the total number of pulses in each channel, determines the total movement in that co-ordinate, and the pulse rate determines the speed of movement. These pulses are recorded on three separate tapes for the

co-ordinates, and a fourth channel, giving control information appertaining to the functions of the machine, other than slide movements, is also recorded.

Machine Control

A digital computor can produce control information of the type described above to any desired degree of accuracy, but this is, of course, useless unless the measurement and control system of the machine slide has a similar degree of accuracy. At the beginning of the work it was found that the use of a load screw was unreliable as problems of backlash and oil film compressibility were virtually impossible to solve economically. The best that can be done is to measure the movement of the surface of the table on which the work is fixed, relative to the main body of the machine. With this method, the machine and tool defection alone will cause errors, which, however, can be reduced to a suitably low value by correct design of the machine tool. The method of measurement itself is difficult, but a method has now been devised utilising optical gratings ruled at up to 30,000 lines/inch. With this figure it is possible to discriminate between a few millionths of

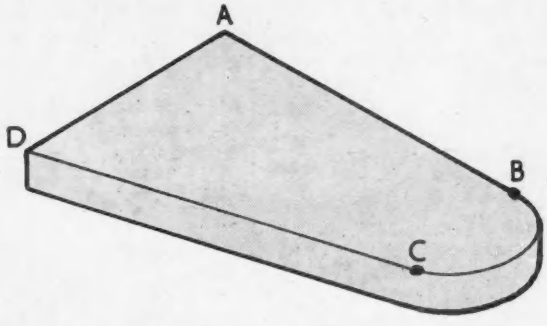


Fig. 2. A two dimensional machining problem to illustrate text

an inch, and by the use of 5,000 lines per inch gratings, it is a simple matter to move a slide consistently to an accuracy of one ten-thousandth of an inch, which is sufficient for all normal engineering purposes and is better than the inherent cutting accuracy of most machine tools. Both photographic and prismatic gratings can be used for this purpose but the prismatic grating has definite advantages when the number of lines exceeds 1,000 per inch. Such gratings have not hitherto been manufactured in sections sufficiently long to be utilised for measurement, but the Light Division of the N.P.L. has for some years been developing a process for making large gratings, and full acknowledgment should be paid to the help received from the Light and Metrology Divisions of the N.P.L. who co-operated in making available gratings of suitable metrological accuracy.

Method of Application

The method of utilising the gratings for measurement is shown in Fig. 3. A suitable length of grating is attached to one section of the machine slide, and a short length of the same grating attached to the other section of the slide, so that one grating traverses the other with the two surfaces almost in contact. If a beam of parallel light is projected through the pair of gratings and they are suitably aligned, the fringe pattern produced will modulate the light transmission when there is relative movement. One complete cycle of variation of intensity will occur for a movement equal to the pitch of the grating, and it is a simple matter to obtain from this variation two discrete electrical pulses per grating line. By arranging two photocells so that the phase of this light variation is different in each, a two-phase electrical system can be formed, the direction of phase rotation of which reveals the direction of movement of the slide.

The servomechanism which controls the table movement is arranged so that on receipt of a command pulse the table is moved in the correct direction until a pulse from the grating cancels the command pulse. Thus if a train of pulses is received the slide is moved at a rate such that a similar train, lagging by an amount not exceeding one pulse, is produced. This means that the error can never exceed one ten-thousandth of an inch unless the servomechanism is overloaded.

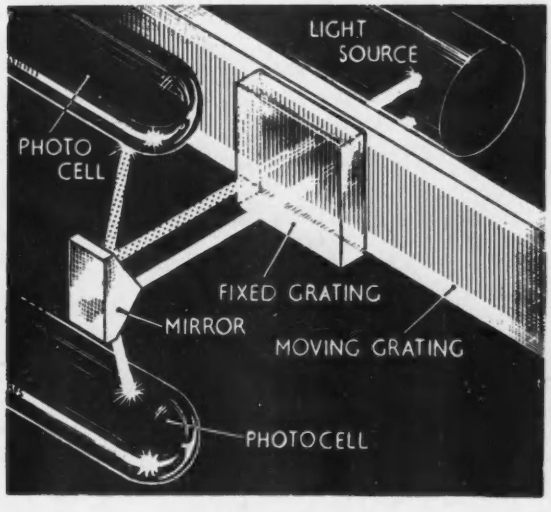
Other Applications

In addition to the application just described, in which the machine table is under the control of a magnetic tape at every instant in time, there is another important use of the grating system in machines in which the table merely requires to be positioned, as distinct from being profiled. Jig-borers, drilling machines, capstan and automatic lathes are machines of this type. Such applications are very much simpler than the one just described, as it is necessary only to set up a number, corresponding to the dimension, on an electronic counter and to cancel this number by the count from the grating. The setting up can be done by hand or automatically by means of punched card or paper tape. Great speed and accuracy are obtainable by this means.

An automatic machine control system such as has been described must be engineered so that it is highly reliable, reasonable in size and financially economic. It is believed that the Ferranti system will meet these requirements. Prototypes will be in full operation early in 1955 and the system can then be field tested under workshop conditions.

Credit for the first digital-controlled machine must go to the Servomechanisms Laboratory of the Massachusetts Institute of Technology where a machine was constructed in 1951 which produced contours, direct from paper tape, by setting in precalculated straight line interpolations. No details of any further development of this machine are, however, available in this country.

Fig. 3. Method of using the ruled gratings to give a movement function



MECHANICAL HANDLING

—The quickest way to cut down overheads

THIS year's Mechanical Handling Exhibition and Convention, to be held at Olympia, London, from Wednesday, 9th June, to Saturday, 19th June, has reached a new peak in the variety and diversity of the exhibits. This is justly so, for in modern industry the major factor in cutting down production cost lies in the application of up-to-date methods of handling and distributing material.

Mechanical handling may fundamentally be divided into two main categories; one where the handling equipment is in itself mobile, and the other where the equipment is static although capable of transporting material from one point to another. In the first category fall such items as mobile cranes, bulldozers, trucks and so forth, while the second is represented by conveyors, overhead transport systems and the like. Both these main divisions are, however, well represented in a variety of forms at the exhibition, together with development in the component items which are used in the construction of the finished devices.

Mobile Equipment

Dealing first, therefore, with mobile equipment, in which electricity plays a major part, we have the range of fork lift and similar trucks. In this field I.T.D. Ltd. are playing a prominent role, and have a heavy duty unit, the Model 45EH which has been specially designed to cope with arduous conditions, and has a maximum load capacity of 4,500 lb. A paper-roll attachment is available, which can be used with this model and can simplify mechanical handling difficulties in the printing and paper-making trades. The well-known "Electricar" industrial platform truck, model TLR6 with an elevating platform and a capacity of one ton, and the "Portapal" pallet transporter with a capacity of two tons, are other items of interest.

Lansing Bagnall have the SFR 225 Straddle Fork Reach truck. When stacking the whole mast assembly can be moved forward by a hydraulic ram system. The truck can, in effect, reach forward to pick up or deposit a load, yet bring the load within its own wheelbase for transportation. The truck is electrically powered with a regenerative braking system and can move a load of 2,500 lb at speeds up to 4½ m.p.h. Made by the same firm for fork trucks are special heads and clamp attachments. The rotating head can invert boxes, box pallets, drums and other items up to 1 ton so as to discharge their contents into other receptacles. The clamp attachments permit the lifting of bales, sacks, crates and drums without the use of pallets.

Coles Cranes are showing the "Colossus," the largest mobile crane on view with a 30 ft jib capable of lifting 92,000 lb at 12 ft radius. Powered by a 250 h.p., 8-cylinder diesel engine, for travelling, with an 80 h.p. Perkins diesel driving a variable voltage generator for the craning supply, this item provides an equipment filling the gap between existing mobile cranes and the large railed unit. A 90 ft strut jib can be fitted and with an additional fly jib a lift of over 100 ft is possible. Safety switches are provided for the hoist and derrick motions, and prevent movement of the jib or load beyond prescribed limits.

Battery-operated vehicles, shown by Coles, include the model 55428 "Electric Eel" Tractor with a maximum drawbar pull of 1,200 lb. The model 54920 "Electric Eel" crane truck can lift 25 cwt, and largest of the series is the "Electric Eel" tractor, model 52698, which has a drawbar pull of 4,000 lb. Other mobile cranes, powered by diesel- or petrol-electric units are the "Aeneas," the "Pyrrhus" and the "Argus."

Brush Coachwork Ltd. are exhibiting two industrial trucks and two vehicles. The HE30 model battery truck has an elevating platform 3 ft wide by 5 ft 6 in. long, with a power-driven hydraulic lifting gear. Flame-proof motor and controller are features of the 2-ton industrial truck which, however, has a manual lift elevating platform 2 ft 2 in. by 5 ft 6 in. wide. Of the tractors, the "COB" 3-wheel unit is already well known, but a new type, the "3 by 3" has a drive to each of the three wheels and thus possesses extreme mobility.

Ransomes Sims & Jefferies Ltd. have two items of particular interest, the Forklift 10 truck, which is one of the smallest being built, and the type H25 electric runabout crane with a capacity of 25 cwt at a radius of 12 ft 9 in. This latter item can operate in confined spaces, and travels hoists and derricks under its own power. It is also capable of turning about its own centre and can run backwards or forewards in a path of any curvature.

Exhibited on George Cohen's stand are models of the "Hoistmaster" Electric Hoist, and the model 2DH/12 "Stacutruc" fork lift truck.

The heading picture shows the Beaumont drag scraper system (International Combustion Ltd.) as installed in the coal stocking area of Rye House generating station

Control Equipment

The Electrical Development Association stand has the theme of "Use Electricity to increase Production." There are three groups of exhibits. Instrumentation; Control in Feeding Processes; and Control of Processes. In the first group an Evershed and Vignoles conveyor speed recorder is shown, and a Radiovisor (Parent) unit counts products on a conveyor belt by means of an electronic cell. In the second group there is an electronic level control by Fielden (Electronics) Ltd. and an automatic electronic weighing device by W. and T. Avery Ltd. In the third group is a moisture control system for drying ovens (Honeywell Brown Ltd.), an ultrasonic viscosity control (Elliott Bros Ltd.), and a servomechanism for use in the reeling of paper, fabric and similar products (Ferranti). This last exhibit stresses the fact that a servomechanism, taking only a few watts, can often be the means of putting many kilowatts at the command of the worker.

Components

British Thomson-Houston Ltd., Rugby, show a great variety of equipment. In addition to electric motors, ranging in size from fractional h.p. types upwards, there are displays of industrial electric control gear, electro-hydraulic thrustors, and typical applications of electronic equipment for the automatic and accurate control of industrial processes. Many of the exhibits are shown as working demonstrations.

Conveyor belting for all purposes is a major item on the Dunlop stand, together with corrosion-resistant linings for plant and pipes, and for road and rail tankers. A specially arranged exhibit, operating under working conditions, illustrates the compactness and particular suitability of the Lancashire Dynamo and Crypto range of motors for driving mechanical handling plant. It will also demonstrate some of the applications of Varionic drive.

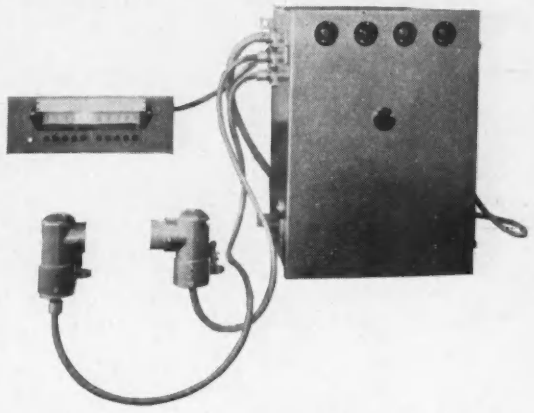
The main attraction on the International Combustion stand is a model to illustrate the Beaumont drag scraper system of coal stocking and handling. Additional to this are the Tyrock full-floating screen and the Vacseal pump for ash handling. Riley Stoker Co., who are exhibiting on the same stand are including Syntron bowl feeders, a Syntron heavy duty back magnet feeder used in coal handling and a standard Syntron spiral feeder unit.

Current collecting equipment is well represented at the B.I.C.C. stand. This covers copper sections for rigid conductors, grooved trolley wire and extensible tough rubber-sheathed flexible cords. There are also examples of resilient moulded connectors and couplers, and trailing cables.

The "Pallage" tubular steel system, which permits the rapid build-up of various forms of materials handling equipment (tray, crate, rack, pallet and stillage) from standard components is a feature of the Tubewrights' stand, and a display of photographs illustrates the use of tubular steel crane and dragline jibs, and shows examples of the application of steel tubes to materials handling problems. An unusual item is the Flexello Castors and Wheels Ltd. self-sprung floating-hub wheel, uses an internal springing system (the Andre/Neidhart system) to provide a combined springing and shock absorbing system.

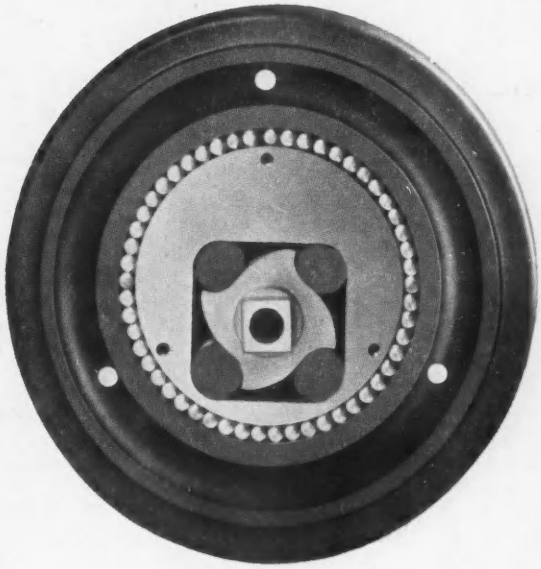
The Metrovick motors include a type MDX steelworks auxiliary d.c. motor, a range of KN-B squirrel cage motors to B.S. 2083, a type DK crane motor and a type KF flameproof squirrel cage motor for conveyor duty in coalmines. There are also examples of control and contactor gear.

Finally, there are the battery makers' exhibits. The D.P. Battery Co. are showing "Kathanode" cells for battery vehicles, and Tudor Accumulator have a representative range of heavy duty cells. Chloride Batteries, however, have decided to show the economics of battery operation as against i.c. engines and prove the total annual cost of running battery trucks is nearly 30% lower for platform types and nearly 35% lower for fork-lift models.



BTH counting equipment for operating at speeds up to 40,000 impulses/minute

The "Colossus" crane by Coles Cranes can lift 92,000 lb at 12 ft radius



Flexello floating hub wheels

Auckland's Brighter Outlook

Jump in Consumption Follows Lifting of Restrictions

WITH the lifting of restrictions of the consumption of electricity following the commissioning of the Maraetai power station, the outlook of the Auckland Electric Power Board is much brighter. During the year ended 31st March, 1953, the Board sold 446 million units, an increase of only 0·98% over that of the previous year, but Mr J. A. Steele, chairman of the Board, reports that since the end of that year the weekly consumption has jumped by about 17½%, while the peak load had gone up by 33%, causing the Board some anxiety, for new bulk supply charges came into operation in April of last year.

Water Heater Control

For the Auckland Electric Power Board this increase in charges amounts to 67·7%—the new flat rate is £10. 18s. per kW compared with £6. 10s. previously. In view of this high cost, the Board decided to introduce control of domestic storage water-heating in order to control the peak load. The report of the Board for the year ended 31st March, 1953, records that a contract valued at over £360,000 was placed with the Automatic Telephone and Electric Co., Ltd., for centralised control injection equipment and control switches. The installation of the necessary control switch on the consumer's premises has been facilitated by the adoption of single metering for domestic premises. Existing water-heater meters will be removed and a control switch fixed in its place.

Operations during the year covered by the report resulted in a surplus of £105,467, which may be considered fairly satisfactory in view of the difficult conditions experienced during the period. In the early part of the year there was a serious deterioration in the supply position, necessitating a 20% further reduction in allocations under the rationing system then in force. Incidentally, it is stated in the report that the direct costs involved in the administration of the rationing system in the four years amounted to £36,721 for the Board. Happily those days are past and, in addition to other promotional activities, plans are now in hand to greatly extend the scope of the Board's Homecraft Advisory Department when the reconstruction of the demonstration showroom has been completed.

A total of 93,392 consumers were connected to the Board's mains at the end of March, 1953, there being a further 2,885 added during the year. Of the total, 51,720 had electric water heaters, and 45,360 had electric cookers. The net revenue per unit sold for domestic supply was 0·7254d., for lighting 1·6973d., and for power 0·7287d. Domestic supply, in fact, accounted for 238·3 million units, lighting for 20·5 million and power for 159·8 million.

Mr J. A. Steele, chairman of the Board, reports that materials were more readily available during the year. The extension of service lines was only restricted by the labour available for such work. The change-over from d.c. to a.c. of part of the network in the city and suburban areas —the largest to date in the Dominion—was effected smoothly, some 10,000 items of consumers' apparatus being involved. The Stores Department received goods to the value of £619,905 during the year, an indication of the volume of materials handled.

Finally, we note that the Board's long-standing claim against the N.Z. State Hydro-Electric Department, arising from the latter's failure to supply the Board's requirements after the introduction of power rationing, was settled by the Board accepting a token payment of £1,000. The claim was for a much more substantial amount, but Mr Steele states that the Board felt justified in accepting that nominal settlement because all supply authorities in the Dominion were affected by the restrictions but had no similar provision for claim in their bulk supply agreements.

Switchgear Appearance and Unit Design

THE appearance and external design of switchgear formed the subject of an interesting paper presented to the 1954 Scottish Design Congress held recently. This was presented by Mr T. Coughtrie, Chairman of the Belmos Co. Ltd., and covered the evolution of small switchgear exterior design and appearance from the early days of open switchboards up to the present closed-in push-button type of motor starters and switch units. At the same time he dealt with the necessity for developing standard units and assemblies so that unit construction could be used. This permitted the erection of complex switching arrangements from a number of standard units instead of the previous system of producing custom-made switchboards. It also allowed extensions to be made to existing control centres as and when required with the minimum of trouble.

He pointed out that information received in a works from a client was often of a sketchy nature. But today most consultants and engineering departments acting for customers could provide a schematic diagram which would in turn give adequate information to the engineer or sales estimator responsible for preparing the scheme. It was remarkable how quickly, using unit-type gear, a proposal could be submitted to a customer.

Unit gear could be developed to cover a wide range of industries, including the requirements of cement making, chemicals, oil refining, textiles, and also such applications as power station auxiliaries, steel mill auxiliaries, coal screening and washing plants, conveyor installations and other types where motor control and switching was involved.

More and more users wished to house equipment in surroundings where it could be maintained in a state of cleanliness and where maintenance could be carried out in comfort and safety. The number who did so could be regarded as a measure of the improved outlook created by the availability of equipment of reasonable appearance, at a competitive price with facilities for easy installation and maintenance which further reduced overall cost.

Finally, Mr Coughtrie said that it had been of interest to him to study a later approach which had been made to the same subject by a much larger Company, and he showed some lantern slides illustrating a range of switch fuses and fuse distribution boards made on the unit principle by English Electric Co., Ltd.

EASTBOURNE, which next week is the venue for the sixth British Electrical Power Convention, has not previously been visited by this organisation in its present form. Yet there is a very real link between them, for it was at Eastbourne in 1948 that Mr J. Eccles, as President of the Incorporated Municipal Electrical Association, handed to Lord Citrine the symbolic torch as a sign of the continuance of the interests that had marked the Association's fifty-two Conventions. Lord Citrine, in turn, gave an outline of a proposed national Convention whose future "depends upon what happens in 1949."

1949 saw the Convention at Torquay, and its success then and in the four succeeding years has led to the return to Eastbourne. As befits the wider interests of the Convention, however, the theme now stretches beyond these islands, and with a distinguished consulting engineer occupying the presidential chair, it embraces the development of both home and overseas markets for electricity and electricity appliances.

The official programme of the Convention is outlined in the accompanying table. It will be seen that in general the arrangements follow those made for last year at Torquay. There is, however, one interesting change. Once more there will be a lecture designed to interest delegate ladies, as well as to inform the delegates themselves. Two lectures, in fact, for Dame Caroline Haslett (E.A.W.) and Mr. W. J. Jones (E.L.M.A.) will be joining forces to discuss electrical aspects of home making. Otherwise, the main features of note are the modest number of papers, which should have the welcome effect of permitting more adequate discussions than have sometimes been possible in an overcrowded programme, and the reappearance of the Electrical Forum, which now seems firmly established as a Convention favourite, providing a useful and convenient curtain-raiser to the Annual General Meeting.

Business meetings of the Convention will be held at the Winter Garden, Devonshire Park, and it will be a welcome convenience to all that the Electrical Exhibition, which forms so important a feature of the Convention, will this year be housed immediately adjoining this meeting place. The exhibition will be open to delegates on each day of the Convention. Hours are 10 a.m. to 6 p.m. on Monday and Tuesday, 10 a.m. to 9 p.m. on Wednesday and Thursday, and 10 p.m. to 4 p.m. on Friday. The exhibition will be closed each day from 1 to 2 p.m. As in previous years, from Wednesday onwards the general public will be admitted to the exhibition. On Monday evening, at 8.30 p.m., the exhibition

Eastbourne Convention Timetable

Day	Place and Time	Event
Monday, 14 June ...	10 a.m., Winter Garden	Convention office opens—remains open each day 10 to 12.30, 2 to 5 p.m. except Weds. and Fri., when it closes at noon.
	1 p.m., Drive Hotel, Victoria Drive	Eastbourne Rotary Club Luncheon.
	8.30 p.m., Winter Garden	Opening of Electrical Exhibition by The President.
Tuesday, 15 June ...	10 a.m., Winter Garden	Civic Welcome and Presidential Address.
	12.30 p.m., Grand Hotel	E.A.W. Luncheon.
	2.30 p.m., Winter Garden	Sir George Nelson: Electrical Engineering in World Trade.
	3 p.m., Pier Ballroom	Ladies' Tea.
	8 p.m., Winter Garden	Mayoral Reception and Dancing.
Wednesday, 16 June	10 a.m., Winter Garden	W. J. Jones: Modern Lighting for Industry, Commerce and the Home.
		Dame Caroline Haslett: Electricity in the Modern Home.
Thursday, 17 June	10 a.m., Winter Garden	D. Bellamy: The Development of the Domestic Electricity Load at Home and Overseas.
	2.30 p.m., Winter Garden	S. L. M. Barlow: The Comparison of Installation Practice at Home and Overseas.
	7.30 p.m., Grand Hotel	Annual Dinner followed by Dance at the Winter Garden.
Friday, 18 June ...	10 a.m., Winter Garden	Electrical Forum.
	12 noon	Annual General Meeting.

The Winter Garden—Headquarters of the Convention

will be officially opened by the Convention President, Mr J. R. Beard, who will be accompanied by Mrs Beard, the Vice-President and Lady Railing and the Mayor and Mayoress of Eastbourne. This ceremony will be open to ticket holders only.

Social functions during the convention will follow a similar programme to last year, with an official reception on Tuesday and the dinner and dance on Thursday. The ladies will be invited to take tea with Mrs Beard on Tuesday.

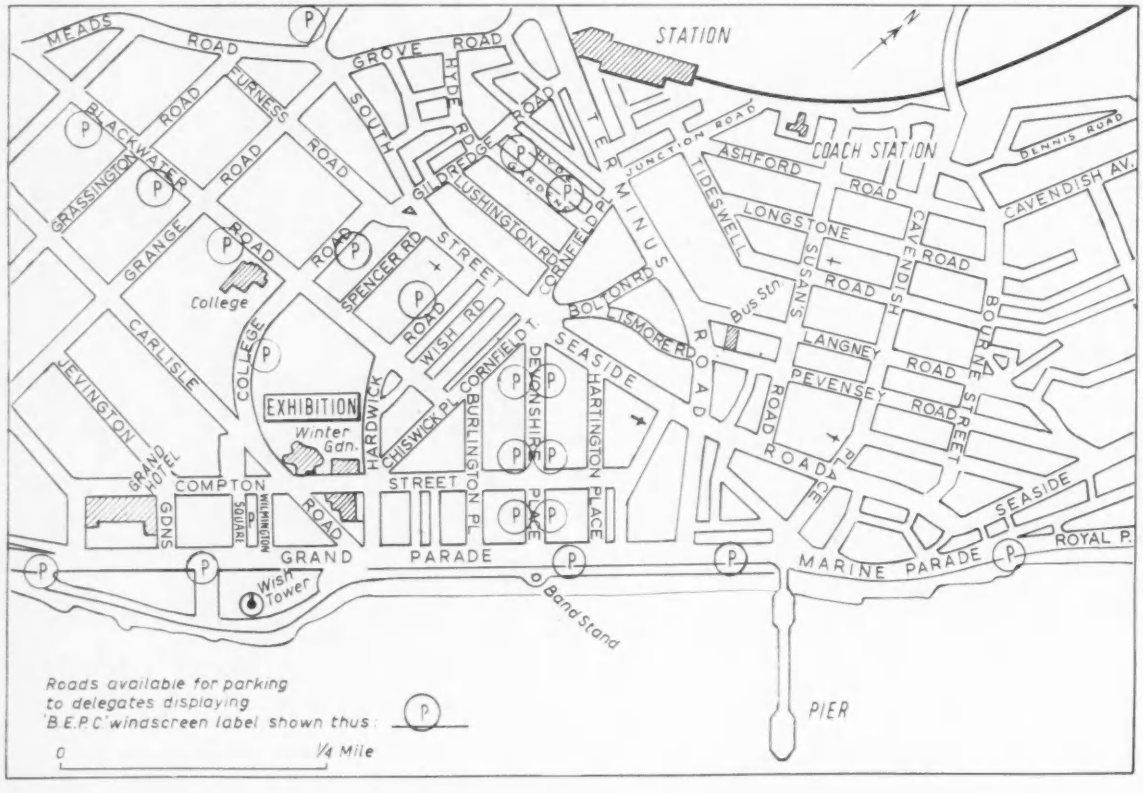
This year, the Exhibition will be one of the largest and most comprehensive electrical exhibitions ever staged at a convention. There will be nearly one hundred exhibitors, most of them manufacturers, although several of the Associations with which the electrical industry abounds will be represented on stands. To house the exhibition, a marquee has been erected covering some 24,000 sq ft of the Winter Garden grounds.

In the pages that follow, we present for the interest of delegates to the Convention and other readers, a preview of the exhibits that will be displayed at Eastbourne. As is traditional at this exhibition, the accent is on domestic electrical equipment, with a strong backing of the distribution plant and equipment.

Gatherings of the industry usually provide an opportunity of reminding everyone of the activities of the Electrical Industries Benevolent Association. Besides its usual stand at the exhibition, the Association will have a connection with the golf tournaments which are such a popular feature of the Convention week. Two competitions will be held this year, on Wednesday, 16 June, and all proceeds from entrance fees will be devoted to the Association. For the men there will be a competition for the "G. P. Dennis Trophy," while the ladies will compete for "The Lady Citrine Trophy." The competitions are being organised by Mr W. J. Bird, from whom information may be obtained at the Grand Hotel, Eastbourne, during the Convention.

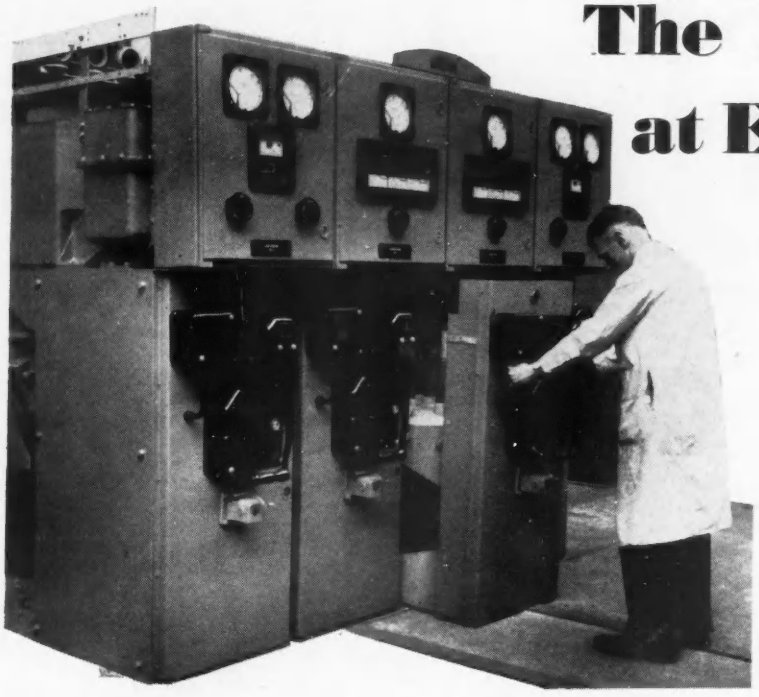
During the course of convention week, our special issue will be published containing a report of the opening sessions, together with photographs of the events.

STREET PLAN OF EASTBOURNE

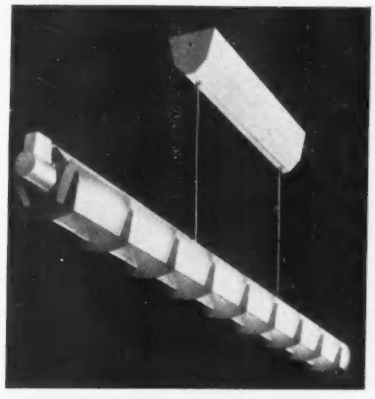


The Exhibition at Eastbourne

DOMESTIC AND INDUSTRIAL EQUIPMENT AGAIN FORM MAJOR FEATURES OF THIS ANNUAL EVENT



Brush metalclad switchgear type VAS air insulated vertical drawout pattern ratings up to 1,200 amps 15 kV 1,250 MVA. Below is a single 80 W lamp F51046 by Ekco Ensign. Tricity's Queen cooker is at the foot of this column



FOR readers' guidance we give below, in alphabetical order of organisations, details of appliances, equipment or displays to be seen at the Convention Exhibition. All told some 97 manufacturing or other concerns are represented at the Winter Garden. Emphasis is again centred on domestic appliances which are shown in abundance, with some manufacturers choosing this event to launch new models. Industrial and supply equipment, however, is well represented and all in all, there is something for every section of the electricity supply industry.

Aidas Electric

Demonstrating electricity's usefulness for water heating are seen two "Sadia" products of recent introduction. For fitting into water tanks where external space is limited is the Aidas "Dumpy" immersion heater having only 1¾ in. cover projection as against 3 in. or 4 in. with earlier designs. Complying with B.S. 1556, the "Dumpy" is available in a range of sizes and is guaranteed for 12 months. Heads are screwed 2¼ in. b.s.p.t for fitting bosses provided on standard tanks and cylinders whilst a pocket is provided for the "Aidastat" should automatic control be required. The other recent addition is the "Select" three gallon rectangular water heater. No. 73.

Airmec Ltd.

New equipment being shown by this firm includes their 5 kVA automatic voltage regulator designed to provide a constant output voltage independent of supply and load current fluctuations. Provided its operating range is not exceeded, the equipment is sensibly unaffected by load, load power factor or normal frequency changes. Provision is made to adjust the output to any value between 210 and 240 V which will be maintained to within ±1% whilst the input voltage remains within the 50 V overall range of the particular value for which the equipment is set. No. 29.

Backer Electric Co.

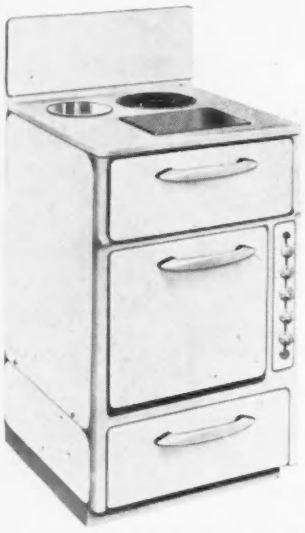
As on previous occasions, Backer's chief exhibits are radiant boiling plates, particularly noteworthy being the recently developed type 8.MC plate. A two-circuit type, it utilises a multicoil element which carries the two separate circuits within one "Inconel" sheath. The inner turns rating is 990 W, and outer turns 810 W, to give a maximum of 1,800 W. All plates are manufactured to withstand thermal and mechanical shock tests, insulation tests, and comply with the minimum laid down in B.S. 774. No. 77.

H. J. Baldwin and Co.

Illustrating the advantages and versatility of electric heating are the "Thermat" electric blankets and pads which dispense with the trouble of hot-water bottles on winter evenings. Among the range is their latest model having a floral sateen cover. For manufacturers they show both mica and ceramic heating elements. No. 58.

Belling and Co.

The main feature of the Belling stand, is a large turntable on which is displayed their full range of cookers. Included in this array is their latest "streamlined" model designed for the modern kitchen whilst standard models, fitted with inner glass doors and "Baby" cookers are also to be seen. For domestic heating are a



B.N.E's. new C90 cooker is well finished. It has a pleasing appearance and reaches maximum oven temperature in 12 minutes

number of fires which, having been introduced only late last season, may be new to many visitors. Among this group is their radiant/convector heater in which the 1 kW radiant unit, inset in the base, provides supplementary convection currents for drying clothing hung on a retractable towel rail above it. No. 65.

Benjamin Electric

For the discriminating householder, requiring well designed plastic lampshades, Benjamin have their full range of "Coolicon" shades on display. Two sizes are available, 9 in. for 60 W and 11 in. for 100 W lamps, in four colours, black, white, green or blue, whilst the attractive "Nursery Coolicon" (a 9 in. size only) has gaily decorated figures to appeal to children. In all models, gallery and shade are produced from two kinds of plastic which spring together easily and securely, employing no screws. The open nature of the gallery allows free dissipation of heat, ensuring that cap and lamp do not become overheated. No. 26.

Berry's Electric Ltd.

Further developments in the "Raydair" convector heater are seen in three new models in which variable thermostats replace the original pattern having a preset cutout. The "Raydair" owner is thus offered a range of temperature settings which may be varied at will. Other recent developments, likely to appeal are the greenhouse and industrial model "Raydair" heaters. To the display of radiant type fires has been added a new "Berrylog" type (known as the "Alderberry.") In common with their new range of period styled fires it incorporates the modified heating system which enhances both its appearance and efficiency. No. 6.

Best Products Ltd.

Making its debut at the exhibition is this company's No. 2 coffee percolator, a model which can justifiably claim to incorporate every requirement for coffee making. By having a double jacket fitted at the base of the coffee stem, thermally insulating the water surrounding the immersion element and thus providing a small amount of water to be initially heated, almost instantaneous percolation is obtained. A preset control gives three variations of coffee flavour, automatically cutting off the maximum heating at a given time which stops percolation but maintains the coffee at a suitable temperature. No. 53.

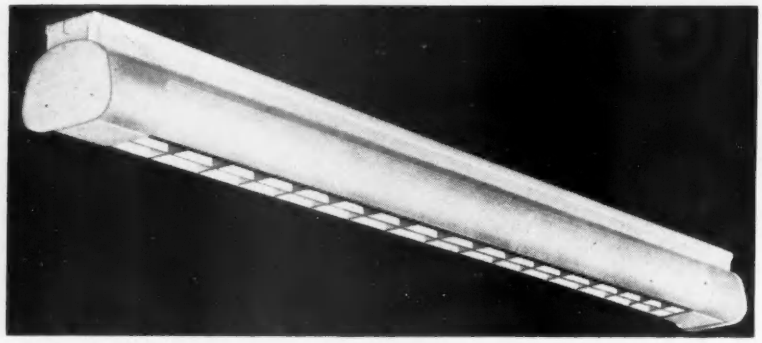
The Henley 4 way (three and one) underground disconnecting box in which three outgoing cables may be taken from one end

Bill Switchgear Ltd.

Being shown for the first time is a cubicle industrial panel fitted with a new design of switched fuse. Known as the "Majestic," the latter is to be produced in 60, 100, 160, 200, 500 and 750 amp sizes, all of which will be suitable for cubicle mounting. Cubicles are manufactured in standard widths of 22 in. and 26 in., butting together to give a streamlined panel which although normally finished in cream enamel, can be supplied in other colours as required. In their display of distribution equipment are featured the re-styled "Vertex" dis-boards, 15/20, 30, 40 and 60 amp sizes being shown, whilst the 60 amp "Crown" switched fuse is now available. No. 19.

Geo. Bray and Co.

Two main thermostatically controlled immersion heaters are now being produced for domestic use, of which one has two sheathed wire elements giving a low wattage density. Known as model LAMS, it employs the easy wiring terminal box mounted on the side of the head. The alternative, model LAQD, is a cheaper model produced primarily to meet Electricity Board requirements for long term h.p. schemes. Only one element is used, whilst supply connections are made direct to the thermostat and element terminals in a cover of simple design. No. 33.



This Ediswan 5 ft fluorescent fitting has a fluted Perspex diffuser and metal louvres

B.E.A.

The Central Authority's display features the increasing demand for electricity during the last 34 years, showing the division of the load between industrial, domestic, commercial and other consumers. Comparison is also made in back-up features of generation costs and electricity prices in 1920 and today. No. 99.

B.I.C.C.

No less than five new products can be inspected on this cable stand, one of which is an 11 kV cable joint of the fully shielded type for screened cables designed for low cost installation. Another h.v product is seen in an impregnated pressure cable joint of simplified design and thus adding to the economy attendant on the use of this type of cable. The joint exhibited is suitable for 33 kV operation

In the lower voltage field come recently developed consumers' service units intended for lower prices houses. They can be arranged for either h.r.c or rewirable fuses. No. 27.

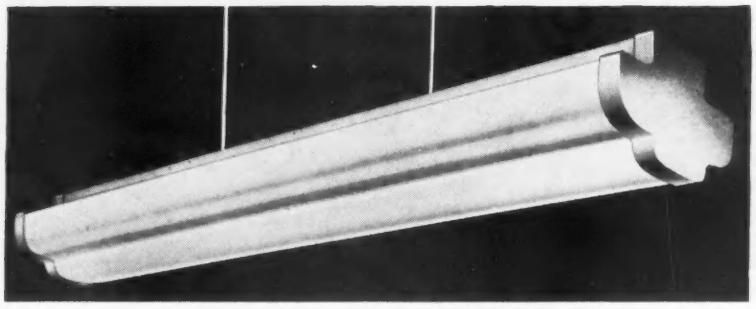
British National Electrics

The B.N.E. range of electric cookers, sole occupants of this stand, have now been supplemented by model C.90, a development of their C.49 cooker, which is on show for the first time. Probably the most important advantage the new cooker holds over its earlier relations is the "Speedheat" oven which reaches 400° F in 12 min, which with a loading of only 2·5 kW, represents a half unit consumption during the heating period. It has an attractive three tone finish—hob, handles and switches in deep cream, panelling in light cream, and plinth in pearl grey. This latter colour is also employed for the oven interior, the finish being a vitreous enamel conforming to the current standards of acid and alkali resistance. No. 25.

recent B.T.H. developments in the lamp and lighting field include the "Mazda" FA.5 xenon flash tube which, in its brief discharge gives a light intensity greater than that of the sun. The two new fluorescent lamp colours "new warm white" and "de-luxe warm white" are prominently featured, emphasising the latter's ability to blend with light from a tungsten filament lamp. No. 38.

Rheostatic Co. show this new thermostat type HRS for control of cookers having top and bottom elements

Below is Falk's "Westlyn" fluorescent fitting for larger stores and commercial premises



B.R.A.

As last year, this Association has organised a Refrigeration Centre on which are represented five widely known makes of domestic refrigerator. All popular sizes are being shown, ranging from the smallest, a new 1·5 cub ft capacity Coldrator model which is heat-operated, to a 9·5 cub ft size. It includes a new size, 8 cub ft, the capacity of a model being introduced by the G.E.C. having zones of different temperatures for "cold cooking." Colour provides a dominant feature, several models having coloured interiors, whilst Frigidaire's four models on show are available in five brightly coloured finishes apart from the standard white. Prestcold feature their "Prestofreeze Junior" home freezer having a 4·05 cub ft capacity and capable of storing an average of 120 lb of frozen food. To complete the stand are five Kelvinator refrigerators, including three variants of their 7 cub ft model one of which incorporates automatic rapid defrosting. No. 98.

British Thomson-Houston Co.

To illustrate the theme "Almost every important lighting development in the last fifty years owes something to B.T.H.", the "Mazda" stand is devoted entirely to the story of the Company's contribution to Britain's lighting industry. Photographic displays depicting

British Vac. Cleaner and Eng. Co.

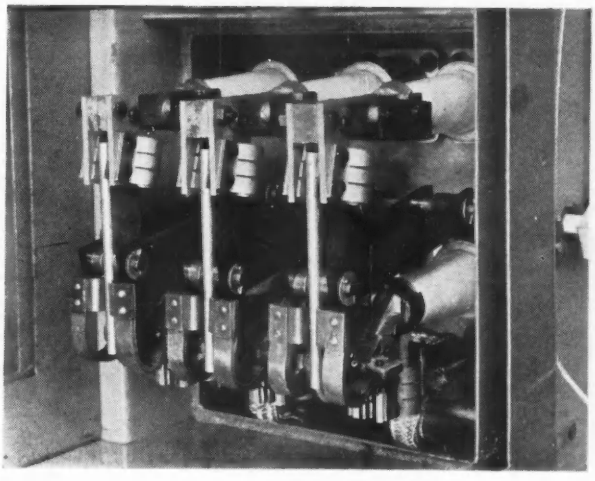
Here can be seen a wide variety of "Goblin" domestic appliances, ranging from the "Lumilarm" bedside lighting fitting and alarm clock to washing machines. The latter, now regarded by many as being no less essential to the modern home than the cooker, is designed for smaller kitchens and kitchenettes having a 4 lb dry wash capacity and 10 in. handwringer. For general home cleaning purposes are seen the widely known "Goblin" vacuum cleaners which, with numerous attachments, extend their use to furniture, stairs and curtain rails. No. 47.

Brush Electrical Engineering Co.

For the supply engineer one of the two Brush stands is given over to their outdoor pattern o.c.b. type "OR.38" which rated at 33 kV, 1,000 A, has a breaking capacity of 750 MVA. Fitted with pneumo-hydraulic closing mechanism using a small quantity of oil stored at high pressure, the breaker can be closed four or five times without recourse to external electrical supplies. On the other stand may be seen a metalclad, vertical drawout, switchgear unit, type "VA5" indoor pattern of 400 A, 11 kV rating, rupturing capacity 250 MVA. Another aspect of their activities is also seen in a 1 h.p. motor. Nos. 4 and 9.

Bulpitt and Sons

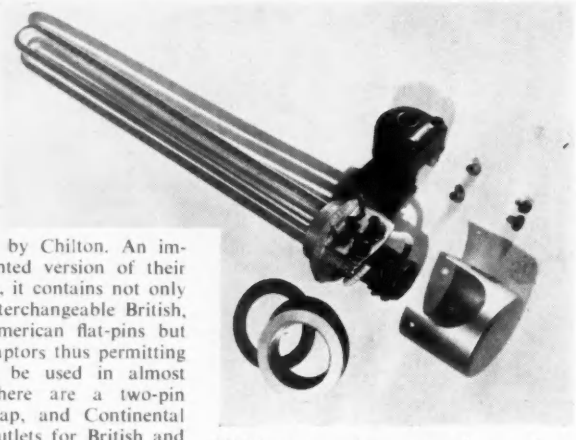
Representative examples of "Swan Brand" appliances and ground base aluminium holloware being shown indicate the wide range of models available to meet every household requirement. One such item is the attractive "Royal" kettle, of modern design and harmonising well with up-to-date kitchen



Crompton Parkinson "ASA" fault making load breaking oilswitch in closed position viewed from below

This photograph shows the position of cable housing sections and floor troughs which afford facilities for easy inspection in this installation of "Panelec" heaters

Geo Bray's type LAMS immersion heater with two sheathed wire elements and side wiring terminal is available in ratings 2 and 3 kW



appliances and equipment. Having a black, moulded plastic handle and chromium plated finish, they are available in two, three or five pint sizes, 850 to 1,800 W. For the living room they show two attractively styled radiant fires. No. 62.

Burco Ltd.

Here the main exhibit is the "Burco" No. 60P electric washing machine which, incorporating a power wringer and 2 kW heater, is the perfect asset for the modern luxury kitchen. For the smaller home, where kitchen space is necessarily limited, the company are introducing their model 122 boiler/washer, of which a prototype will be on view. Its design combines the advantages of the smaller washing machine with full facilities for heating and boiling. In their well known range of wash boilers, two re-designed models are being shown. No. 28.

C.M.A.

In a form of display which has proved successful at earlier exhibitions this year, the C.M.A. are using specially enlarged photographic transparencies illustrating industry, transport, building and telecommunications as settings for telescoped samples of cable supplied for these purposes by their seventeen members. Varying from heavy power to complex light current cables, the display provides a representative cross section of members' products. An additional display shows plastic cables for whose development C.M.A. members have been largely responsible. No. 96.

Chilton Electric Products

A newcomer to this year's exhibition is the universal shaver connection kit recently introduced by Chilton. An improved and augmented version of their transformer-adaptor, it contains not only the adaptor with interchangeable British, Continental and American flat-pins but now three other adaptors thus permitting electric shavers to be used in almost every country. There are a two-pin adaptor, bayonet cap, and Continental screw fitting with outlets for British and Continental pins. No. 56.

Clang Ltd.

In a range of some 300 electrical accessories are to be seen new items in 5 and 15 A weatherproof plugs and sockets with solid brass bodies, designed for use in installations where damp or wet conditions are encountered. Flexible conduit tubing, another recent introduction, is also to be seen, samples being available for test purposes. Designed as an alternative to metal conduit for domestic installations, this new material increases both speed and ease of installation, and its use is claimed to reduce labour costs by up to 50%. No. 64.

E. K. Cole Ltd.

Units in the latest "FR" series of "Thermovents" being shown here incorporate a new duct and element system resulting in a considerable increase of air through the heater and consequent lower outlet grille temperature. A high convection efficiency is obtained with an enhanced standard of safety in use. Styled to blend with most interior decoration schemes, the "FR" series has a moulded plastic front panel in walnut finish, models rated at 1 kW or 2 kW being available. Also having these operating features, the "SR" series is the equivalent industrial "Thermovent." Having ratings of 1 kW, 2 kW or 3 kW, heaters in this range are housed in a robust steel case finished in bronze stove enamel. No. 85.

Crompton Parkinson Ltd.

For the switchgear specialist is being shown a typical "ALA" metal-clad, o.c.b. unit coupled to an "ASA" fault-making, load-breaking, oil switch unit. The former, of the vertically isolating, horizontal draw-out type, is available rated up to 1,600 A, 11 kV, 500 MVA breaking capacity, whilst the switch unit, having a 400 A continuous load current rating at 11 kV, is designed for a making capacity of 55,900 A peak assymetrical current, and 21,900 A symmetrical current. Another aspect of the company's activities is seen in a 5 kVA s.p. rural type transformer having a novel tank design. No. 7.

Dewrance and Co.

Among a representative selection of boiler mountings and valves for high pressure, high temperature steam installations is to be seen an 8 in., fabricated, parallel slide valve complete with electrically operated valve equipment for operating steam pressures up to 3,000 lb/sq in. 1,100°F. The bore is of venturi form permitting smaller internal components and operating gear, with less load on the hand wheel, whilst the use of a fabricated body enables uniformity in material specification and thickness for both valve and pipes to be maintained. Also of fabricated construction is their boiler water gauge which incorporates a bi-colour illuminated water level indicator, steam and water spaces thus appearing red and green respectively. No. 3.

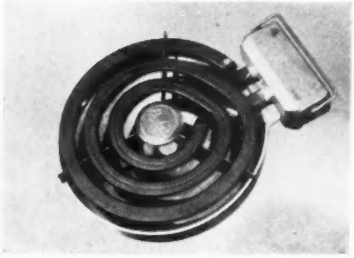
"Diamond H" Switches Ltd.

Featured in the "Diamond H" display is a new range of slow break, single and double pole rotary reciprocating switches specially designed for domestic appliance manufacturers. Suitable for a.c. supplies only, the switch is compact in design, its whole assembly being mounted on high quality porcelain ensuring that switch operation is indepen-

dent of the cover. This construction also facilitates examination of the contacts under operating conditions. Another branch of their products is represented by a new range of thermostats, series "6TH" to "13TH." Provision is made for front of cover calibration, neon pilot lighting, automatic pre-heating and other special switching arrangements. No. 14.

Dimplex Ltd.

Now comprising eight panel type models with loadings from ½ kW to 2 kW and two column type models, 1½ kW and 2 kW, the full range of "Dimplex" permanently oil-filled electric radiators being displayed can meet a wide variety of domestic commercial, industrial and other heating requirements where low surface temperature convection type space heating is demanded. Apart from the standard colour finish of old bronze, all models



can be supplied to order in gold, cream, white, silver grey, sky blue, pink and eau-de-nil with feet, castor wheels or wall brackets fitted as required. No. 54.

Dowsing Co.

Representing this company's range of heating equipment are electric blankets, medical pads and pressing irons. The blanket comprises two layers of high quality, all wool, fast dyed material bound by satin, between which the heating element is firmly secured. Asbestos insulated, and of cupro-nickel wire, the element allows the blanket to attain a safe maximum temperature. It is supplied for normal supply voltages, and a matching colour poplin cover is also available. For engineers concerned with industrial consumers, they offer a virtually infinite range of "Gunfire" time switches and several types of process timer. No. 40.

E.L.M.A.

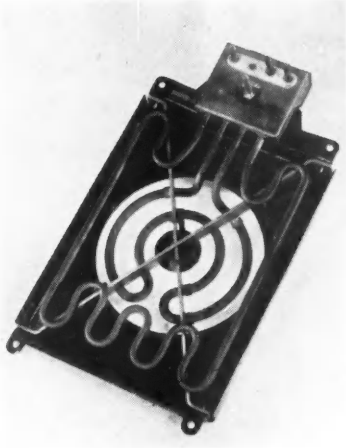
Here the Association's Lighting Service Bureau are demonstrating lighting principles and practice in a display which lends itself for adoption in service centres and showrooms as an aid to the development of the lighting load. An important feature of the exhibit is the "de-luxe warm white" fluorescent tube, its suitability for use in domestic interiors being demonstrated in terms of both colour appearance and colour-rendering properties. No. 97.

E.A.W.

The importance of the kitchen as the housewife's workshop is being emphasised by the Association in a kitchen re-planning competition at present running for members and students from affiliated schools. Two kitchens are given in the competition, in an Edwardian house and in a 1930 house, both of which have to be re-planned using standard kitchen accessories and electrical appliances. No. 90.

E.I.B.A.

Designed by E.D.A., the Benevolent Association's stand takes the form of an information bureau giving details of their activities in providing a progressive social service for all non-manual personnel engaged in any branch of the industry. Visitors can learn of the scope of the work, and the way it is carried out in Head Office and the 44 area branches, whilst copies of the Year Book and other literature are available. No. 5.



Vital components of a good cooker are the Backer new 8 in. Radiant Boiling Plate type 8 MC with max. rating 1,800 W (left) and the Metrovick "Redring" griller-boiler element above

Edison Swan Electric Co.

In a display of lighting fittings, lanterns, wiring accessories and stationary batteries is seen a series of new 5 ft decorative fluorescent fittings. They are additions to the "Ediswan" basic range, which employs, as standard for all fittings, a one or two lamp control unit channel, with a variety of diffusers or reflectors. Of the five, one employs a reflector face plate fitted to the base and a one-piece smooth opal "Perspex" diffuser which simply sits in grooves in the reflector. The other four have cast end plates secured to the ends of the channel, into which are fitted "Perspex" diffusers, either totally enclosing the lamp or with a metal louvre fitted in the base to provide additional downward light. No. 93.

Ekco-Ensign Electric

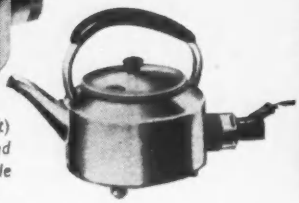
From over 160 fluorescent lighting fittings under production this company is offering a representative selection which include two new fittings being introduced at the Exhibition. One of these is a cornice fitting, accommodating one 5 ft, 80 W lamp and constructed of reeded "Perspex" panels and metal louvres available in a variety of colours to blend with existing schemes. Also a single 80 W lamp fitting, the other unit was designed by the Building Research Station. Of the pendant type, a ceiling box containing all control gear and a spine supporting the lamp, it is modernistic in design and suitable for all forms of general lighting. No. 84.

Electrolux Ltd.

Latest addition to the "Electrolux" range of refrigerators on show here is the L.500, a 5 cu ft capacity model incorporating a large frozen storage and ice-

Creda's latest "Super-Comet" cooker model OH6, which has a new enhanced control panel

This model 2939 Pylon kettle (below) by Premier replaces the older 2839. Best Products No. 2 Percolator has flavour control and coloured indicator lights (right)

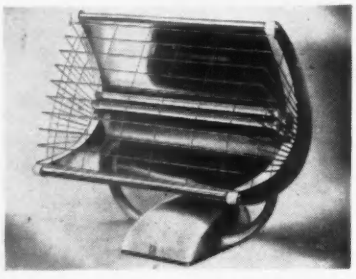


Bulpitt's "Popular" Kettle (left) in 3 and 6 pint models and Falks new "Teatime" kettle has a grease-proof handle

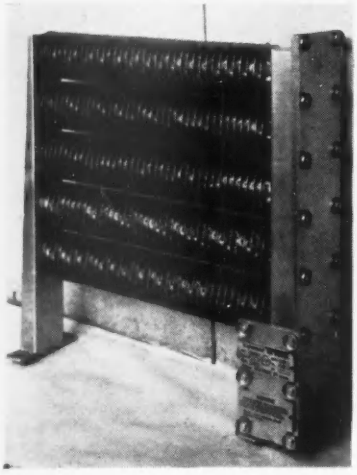
making compartment. Of the absorption type, and consequently silent in operation, it has an approximate daily average consumption of 2·25 kWh. An improved shelf construction gives some 9·75 sq ft of shelf area, whilst two door shelves provide convenient storage for bottles and narrow containers. Also on show is the model 55 vacuum cleaner, a domestic model which, together with the attachments provided, provides the house-proud housewife with equipment to tackle virtually every cleaning job. No. 79.

George Ellison Ltd.

For many power station engineers, the centre of interest on this stand is the new 11 kV o.c.b. unit for 11 kV, three-phase systems, having a rupturing capacity of 250 MVA. It meets the modern demand for economy of space and simple lines whilst retaining the advantages of easy access to all interior parts. Other switchgear on show includes a 45 MVA, A.S.T.A. tested switchboard for voltages up to 660, the c.b.s being rated at 400 and 600 amps. From their range of starter gear they show the new 20 A direct-on unit incorporating h.r.c. back-up fuse protection. Isolation is simple, being effected merely by turning the switch knob, and provision is made to padlock the mechanism in either position. No. 36.



Ferranti's floor model F.3108 fire in a cream frame with polished or "Solium" reflector and below a four-tier 2·5 kW 230 V FLP certified Heatrae space heater



E.M.I. Sales and Service Ltd.

One of the highlights on this H.M.V. Household Appliances stand is a new automatic, controlled heat, electric iron which is being introduced at the Exhibition. Known as "Milady's" iron, model IC.10, the iron is the forerunner of several new H.M.V. appliances. It is scheduled for trade release in September. A snap action type thermostat is used controlling a nickel-chromium tape element wound on serrated mica, with radio and television interference suppression incorporated. Having a rust-proof, vitreous enamelled body and mirror finished soleplate, the iron weighs some 4¼ lb and is available in a.c. or a.c./d.c. versions for normal supply voltages. No. 13.

English Electric Co.

Featured in this display of domestic appliances are two new refrigerators and the automatic cooker, being shown in white and mushroom grey, with the recently modified auto-control panel now carrying an independent switch for the 13A socket-outlet. The model EA83, 8 cu ft refrigerator has many eye-catching features likely to appeal to the modern housewife. Of particular note are the freezer, conveniently situated across the top of the storage space, a low temperature drawer, quick-release separators in the ice-tray and three polystyrene shelves fitted to the inner panel of the door. In the EA34 refrigerator, models are available with right or left hand hinging for the door, whilst spring releases have been introduced on the rod shelves. No. 75.

Falco Electric Appliances Ltd.

Highlighted on the "Falco" stand is their "Royal" electric cooker which, for families in which the housewife is unable to give constant attention to cooking, incorporates automatic timing switching the cooker on and off at predetermined times. Like the other controls, the oven times and thermostat are mounted on the splash plate, in the centre of which is fitted tubular lighting. Three radiant type hot plates are utilised, whilst the grill is separated from the hob entirely. Of more conventional design is the 16B cooker, having a grill/boiling plate, and two ordinary boiling plates with controls spaced down the side of the oven. Also on show are their 1 kW and 2 kW electric fires. No. 87.

Falk, Stadelmann and Co.

Recognising that the flush fixing of power (13A or 15A) socket-outlets can, in the restricted space behind the outlet, result in unseen damage to the cable, Falks are highlighting a new range of "bracket fixing" sockets. All cables and terminals are visible during fixing, the separate plate being attached afterwards, thus removing any doubt concerning the effectiveness or safety of the connections. The 13A size outlet conforms to B.S.1363, fitting into the standard box which will also accommodate the 15A outlets either of the switched or unswitched types. Also on view are 24 in. and 30 in. consumer control units for surface, semi-flush and flush fixing. No. 22.

Ferranti Ltd.

Exhibiting the advantages of electricity for radiant heating is a range of electric fires for wall, panel and floor mounting designed in the contemporary style. Having parabolic reflectors directing heat into well defined parallel paths and high quality elements, the fires are fitted with safety guards exceeding the requirements of the relevant British Standard thus adding to their safety. Electric clocks in moulded plastic and wood cases of various designs and colour finishes complete the domestic appliance display. Representing the company's transformer products are scale models of large power transformers, in which are included those of a 120 MVA, 275 kV unit supplied to the B.E.A. for the Super-Grid. No. 74.

H.M.V's "Milady's" iron makes its debut at the exhibition. Revo's automatic heat controlled iron is a best seller

This Servis model S has a 2 kW heater and automatic pump incorporated

General Electric Co.

Pride of place on the G.E.C. stand is given over to the model DE81, 8·1 cu ft capacity refrigerator being introduced at the exhibition, a similar model being shown on the B.R.A. stand. It features zones of different temperatures for various foods, whilst an eye level thermostat gives ten temperature settings including an "extra cold." At the top of the compartment is a freezer unit for long term storage of up to 40 lb of frozen food, below it being a quick-chiller, several degrees colder than the main food compartment and suitable for quick-chilling beverages, soups, salads and the like. The main food compartment is also subdivided for various foods. On the heating side are seen a basic range of immersion heaters, also newcomers, designed to facilitate wiring, and 1 kW and 2·5 kW "Nightstor" heaters. No. 86.

Glenfield and Kennedy Ltd.

Essentially a "prestige" stand, this firm is featuring photographic examples of their water control equipment for hydro and steam power stations. One or two full scale examples of "Glenfield" valves, including the tilting disc type non return, and standard sluice valves, complete the display. No. 20.

Griffiths Bros. and Co.

Newcomers to the Convention exhibition, this company feature their well known "Ferrodor" paint widely used in the supply industry for metal protection. Sample films of "Ferrodor" showing the flexibility of coatings and general appearance are available for visitors to take away, whilst illustrating its many properties is a brief selection of metal structures which have been regularly maintained by this method. Insulating varnishes made by the company are also well to the fore; various electrical parts indicating typical impregnating and finishing treatments. To complete the stand are displayed newer additions to their range, of particular note being the "Vitros" stoving finishes for water heaters, meters and domestic appliances generally. No. 68.

Hague and Mackenzie Ltd.

Being displayed on this stand is the company's range of "Pyramid" ground base aluminium utensils for use on electric hot plates. Notable among these is their series of black base utensils designed for radiant boiling plates. For the economising housewife there are a variety of double purpose utensils, of which the porringer/saucepan with interchangeable lid, batch egg poacher/pudding steamer and grill/fry pan exemplify the developments in this sphere. No. 80.

Hall and Pickles Ltd.

Specialists in electric heating applications will find a newcomer on this stand in the "Kanthal Super" electric resistance alloy capable of operating at 1,700°C. Providing a substantial increase in the range of temperatures covered by metallic resistors, this new material will be regarded by many as an important development in the field of scientific and industrial heating. Also being shown are the company's "Nicralloy" and other "Kanthal" alloys capable of operating at temperatures up to 1,350°C. No. 83.

A. Heaton and Co.

For the transformer designer, emphasis is being given to valves used on transformers, units ranging from ½ in. to 2 in. bore gunmetal "Fullway" valves, with flanged ends and an indicator and locking device, to a 6 in. cast iron sluice valve under a test of transformer oil at a pressure of 100 lb/sq in. A new design of transformer radiator valve is also being shown. A full bore valve, it is designed so that the stoppers slide away completely from the base. No. 41.

Heatrae Ltd.

Centrepiece of this array of heating appliances is the "D.O.T." water heater. Of the thermal storage type, it is available in sizes of 1½ and 3 gallons, rated at 750 and 1,000 W respectively whilst the adjustable thermostat gives a range of water temperature. For garages, paint shops and other hazardous areas there are on view examples of their floor and wall mounting space heaters having flameproof enclosures. Employing gilled tubes enclosing the heating elements, floor mounting units are available two to five tiers, ratings 500, 750 and 1,000 W/tier and wall mounting units of one to four tiers. No. 59.

W. T. Henley's Telegraph Works Co.

For the supply engineer there is an impressive display of "Henley" cables, ranging from super-tension types to aluminium sheathed and fully impregnated non-draining cables. Among the former are samples of oil filled and gas cushion cables for pressures up to 132 kV, a notable example being a length of 110 kV three-core oil-filled cable. Selected items of distribution equipment, representing activities of the company in this sphere of supply engineering, include a four way underground disconnecting box which is novel in providing three of the cable ways at one end of the box, and the remaining way at the other. No. 8.

Hoover Ltd.

This company's full range of domestic appliances on show at this stand include their well-known upright vacuum cleaners. All three models, standard, industrial and junior, utilise the triple cleaning action established by this company—beating to remove grit; sweeping to remove clinging dirt and suction to remove dust. Both household models are provided with attachments for above-the-floor cleaning. Completing the cleaner range are the cylinder cleaner and "Dustette" hand cleaner. No. 91.

Horstmann Gear Co.

For automatic street lighting control and industrial and domestic uses this company offer a variety of time switches ranging from handwound models to syn-

Falco's "Royal" Cooker is again to be seen. It is a deluxe model with automatic timer

chronous motor driven units with spring reserve. Of particular note is the type suitable for fluorescent street lighting control. It incorporates two circuits so that full lighting may be switched on at dusk, reduced to half-lighting at midnight and finally switched off at dawn. Where mounting space is limited, the type "Y" switch, claimed to be the smallest available, has particular advantages. No. 82.

Hotpoint Electric Appliance Co.

Showing features of the company's model H.30 refrigerator is a special display model partly made from "Perspex" to enable visitors to view the equipment incorporated. An attractive device included in this 4·5 cu ft unit is the controlled temperature butter niche inside the door. The labour-saving minded housewife will find the CF/P washing machine of appeal with its power-operated wringer. In a stylish cabinet, it employs a bowl emptying pump. No. 35.

Hurseal Ltd.

Although the variety of domestic space and other heating appliances on show here indicate the convenience and adaptability of electricity for heating purposes, an equally important exhibit is seen in the display of heat insulating materials. Essential in most domestic premises, such insulating materials prevent excessive heat loss to the atmosphere from the water system or through the roof and thus contribute toward considerable saving in fuel costs. No. 94.

Jackson Electric Stove Co.

Much of the attention on this stand is devoted to the popular "Two-Ninety" electric cooker which in design and appearance is suited to domestic layouts of the contemporary style. Also on view are the 194J and 192J "Clear-view" glass door models finished in two-tone ivory vitreous enamelling. Both cookers enable the user to inspect the food without opening the main door in which the glass panel is fitted. No. 92.

Jenson and Nicholson Ltd.

Indicating the variety of finishes offered by this company to the electrical industry is a number of pieces of electronic equipment finished in different materials. Particularly noteworthy among the latter are a solventless impregnating varnish, "One coat" stoving hammer finish and "30 minute" stoving rivelling enamel. No. 89.

Johnson and Phillips Ltd.

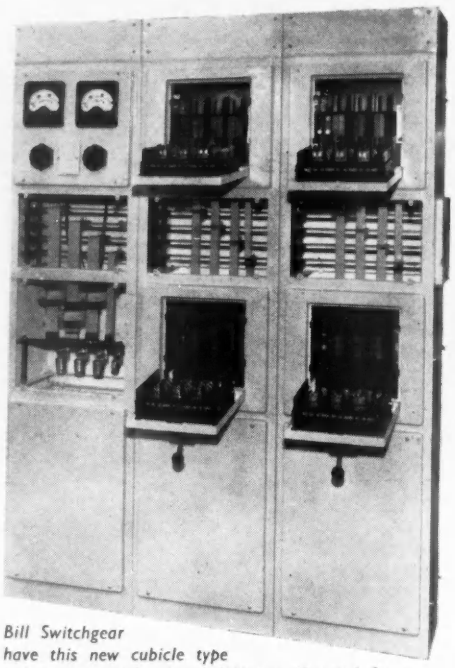
Equipment taken from J. and P. cables, switchgear and transformer production are displayed for inspection by visitors, exhibits include an extensive range of aluminium sheathed power and wiring cables. Among switchgear products is seen an air-insulated metal clad unit (type AG16) suitable for use on systems up to 250 MVA, 6·6 or 11 kV. There is also the type TOS oil switch which, capable of being fitted into any normal J. and P. h.v. switchboard, may, in a ring main unit, be isolated for servicing without interrupting the supply to adjacent units. No. 24.

Langley London Ltd.

For equipment designers is displayed a useful variety of insulating materials in mica and laminated plastics. An interesting product which suggests many applications is silicone bonded glass fabric tubing, now being produced in bulk. It combines the advantages of high temperature resisting and low moisture absorption properties. In view of the intricacies of fabricating and cutting these insulating materials, the company advise the purchase of completed parts, manufactured in accordance with drawings, examples of such tooled and fabricated work being shown. No. 55.

Lincoln Electric Co.

Feature of this company's welding equipment on show is the "Shielded Arc" welding electrode by which the arc is entirely submerged by a coating of flux, protecting the weld metal from atmospheric attack and shielding the arc from view. A particularly useful welder employing this principle is the "Manual Lincolnweld." Using a lightweight welding gun feeding both electrode and flux, it achieves high welding speeds and current with a small diameter electrode. This combination of low diameter electrode and high current has the advantage of reducing the time spent on joint preparation and gives deep penetration of the weld. No. 16.



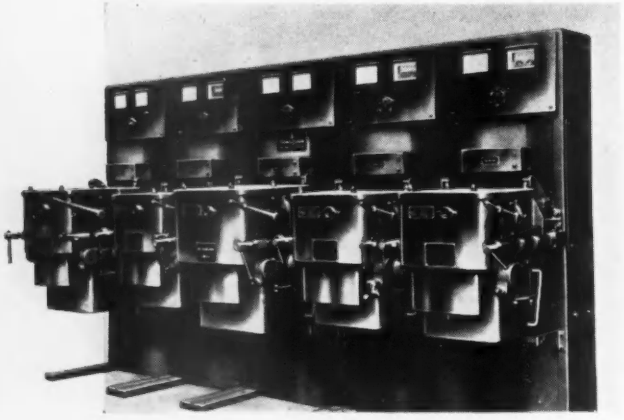
Bill Switchgear have this new cubicle type industrial panel fitted with "Majestic" switch fuses

Line Equipment Ltd.

Specialists in the manufacture of outdoor, air-break equipment for use on h.v. systems, L.E.L. are showing typical examples taken from their range of isolating switches which covers all types up to 275 kV. Also on view are standard and repeater fuse switches fitted with h.r.c. fuse links, liquid fuses, and fuse isolators together with transformer excess load indicators. No. 17.

Robert Maclaren and Co.

The temperature control of moving curved surfaces, whether of rotating drums or rollers is often required in modern industries but its attainment presents considerable difficulty. One of several new thermostats on this stand, however, is a model recently developed for this service, comprising a liquid filled system of copper capillary tube and an operating bellows. The capillary tube is led to a shoe to form a pad of capillary tubing which is placed on the surface, changes of temperature in the latter being then transmitted and measured by the pad. No. 76.



A 45 MVA ASTA tested switchboard for voltages up to 660 volts; cb's rated at 400 and 800 A. By Geo. Ellison

Marco Refrigerators Ltd.

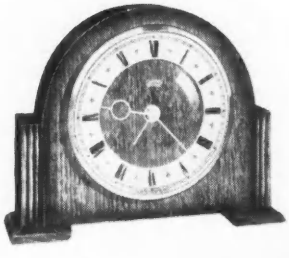
Emphasis is given to the commercial cold storage of food on the Marco stand in the six commercial models shown. Where it is required to display produce under hygienic conditions the display counters on view are eminently suited. Two types are available, giving half and full vision of the produce being stored, in lengths of four, six and eight ft. A particularly useful feature is the marble top slab which enables the display counter to be used for handling and wrapping food. No. 67.

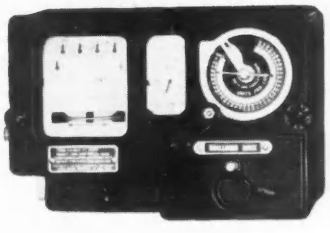
Metropolitan-Vickers Electrical Co.

Four of this firm's manufacturing sections are represented in a display of electrical equipment ranging from instruments to lamps. In the former group is seen the types A2 and A3 portable chart-recording meter, for single or polyphase circuits eminently suited for detailed investigation of a factory or large commercial load. From the switchgear section comes the type MC, six-way fused switch dis-board which is available in four sizes with maximum switch ratings of 60, 150, 300 and 500 A. A number of "Redring" 500 kV heating elements are displayed, including the "Delta" boiling plate which, having two separate D-shaped elements, facilitates the use of two utensils side by side on a single 8 in. plate. The array of lamps and lighting fittings is notable for the prominence given to industrial and commercial fittings for 8 ft, 125 W fluorescent lamps. No. 61.

Monsanto Chemicals Ltd.

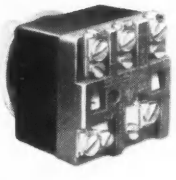
In a display of plastic fluids and solids, particular interest is centred in "Pyroclor" fire-resisting cooling fluid designed for use in transformers. Apart from the advantage conferred by its inflammability use of the liquid enables transformers to be sited indoors nearer the load point, eliminating the need for secondary fire precautions, whilst avoiding maintenance troubles in dusty atmospheres. Non-oxidising and non-sludging, the material has good electrical properties and a low viscosity making it suitable for use in low temperatures. No. 15.

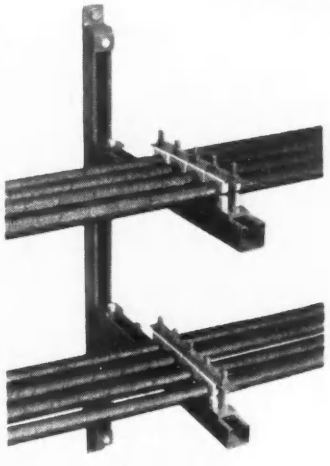


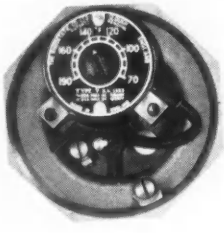


Above, Smith Meters prepayment meter type APR and below an example of the new "Diamond H" range of rotating cooker switches

Smith's Electric Clocks show their handsome "Morling" timepiece (above) whilst right is Sangamo, Weston's single phase S.29 watthour meter







Siemens are introducing their "Sierack" system for cable suspension and above can be seen the easy wiring feature in the head of the new G.E.C. immersion heater

Newman, Hender and Co.

Under the name of British Specialities Ltd., this company is showing "Vee-Reg" steam valves. Types on view include screwed and flanged bronze valves and forged steel screwed and flanged units both in sizes up to 2 in. for medium and high pressure steam service. Also to be seen are 4 in. cast steel flanged valves for operation at pressures up to 650 lb/sq in. of superheated steam and 8 in. cast steel valves supplied for normal steam and fluid valves. Units are shown provided with indicators demonstrating the complete and fractional regulations of the spindle. No. 57.

Panelec (Gt. Britain) Ltd.

Depicting the varied application of the "Panelec" embedded low temperature radiant floor warming system is an aerial photograph on which are superimposed models of buildings such as church, school, hospital and other typical establishments. An arrangement of coloured lights shows the normal cycle of heating (arranged in "off peak" periods) over the 24-hour period, load, occupancy period and "Panelec" heating also being illustrated. No. 63.

Parnall (Yate) Ltd.

"Washing completed in 60 minutes" is the claim for the all-electric washing machine shown in its two versions (heated and unheated) on the Parnall stand. In heavy gauge vitreous enamelled sheet steel, its capacity of 7 gallons, 5½ lb of dry wash makes it most suitable for large families, the power operated wringer eliminating the manual work involved in this operation. When the laundering is finished the pump unit empties the waste water. There is now a vitreous enamelled accessory which fits over the unit to provide a table-top, a useful addition where space is limited. No. 66.

Partridge, Wilson and Co.

"Davenset" power transformers feature prominently on this stand, two sizes designed to the current T.1 specification being shown. Of particular appeal to the supply authority is the low iron loss of the smaller unit, achieved by the use of high grade transformer steel. A 15 kVA pole mounting unit, its iron loss totals only 72 W. The larger unit has a 500 kVA rating, being shown without its tank to display the internal construction of coils core and clamps. Another example of "Davenset" manufacture on view is a modern rectifier unit for charging batteries used in switch tripping operations. No. 1.

Philips Electrical Ltd.

Sole occupant (apart from its demonstration team of girl operators) is the well-known "Philishave" electrically powered dry shaver amply demonstrating how electricity may be employed to cater for such intimate domestic tasks as shaving. Ample facilities, including specially illuminated shavers, will be available and would-be users will be given every opportunity to shave—or be shaved. No. 34.

Premier Electric Heating Ltd.

Particularly pleasing in the display of electric fires is the screen heater, which in contemporary style, harmonises well with modern furnishing schemes. For kitchen or bathroom heating, especially where floor space is limited, the "Parabain" wall mounted heater is ideal. It is fitted with a hanging cord for adjusting the position of the parabolic reflector to give heat at the desired horizontal level. Finished in ivory, it has a loading of 1,000 W. A change is seen in the appearance of the chromium plated "Pylon" kettle in which the handle design has now chromium plated brackets. No. 37.

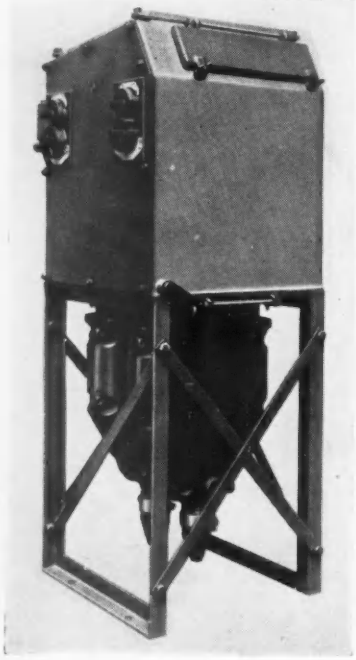
Revo Electric Co.

Forming the main feature of the "Revo" display is the "Monarch" electric cooker, the prototype of which was introduced last year, although now the standard production model is being shown. Novel in design and construction, its unusual feature being the siting of the four control switches along the upper edge of the splash plate, the cooker complies with most of the suggestions put forward in the E.A.W. publication, "Towards Perfection." Other appliances include the 12 in. and 16 in. "Airmaster" fans for desk or wall mounting, electric fires, and the recently introduced "Automatic" heat controlled electric iron F14480. No. 49.

A. Reyrolle and Co.

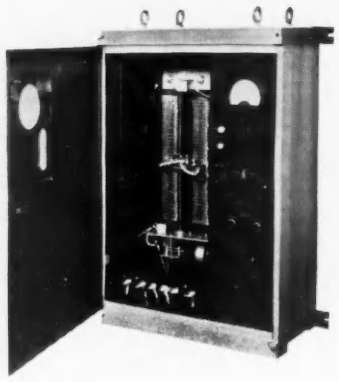
Two new developments to be seen on this stand comprise an outdoor combined ring main switch and tee-off fused switch unit for rural application together with a double-tier, air-break circuit-breaker panel eminently suitable for power station auxiliaries. The ring main unit has two oil immersed switches capable of breaking their full load current rating of 400 A, whilst suitable for making circuit on two faults of up to 250 MVA at 11 kV. An extension to the "Reyrolle" class SA range of medium voltage air insulated metal enclosed switchgear, the double tier unit has a rating of 600 A at 440 V with a rupturing capacity of 25 MVA. No. 72.

Reyrolle's combined 11 kV ring main switch and tee-off fuse switch outdoor unit

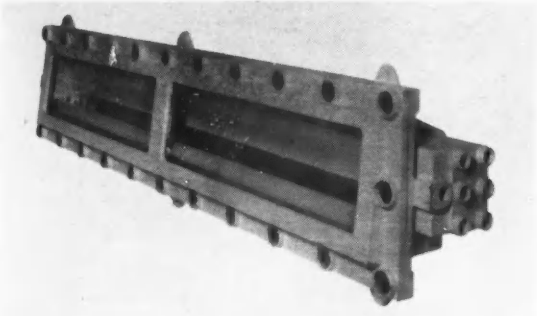


Rheostatic Co.

For cooker designers is being introduced a new thermostat, type HRS. Designed for control of electric cookers having top and bottom elements, it is arranged so that the top element may be used either singly for grilling or in conjunction with the lower element for rapid pre-heating for baking. By merely depressing a push button switch on the control top the thermostat is brought into operation for preheating, automatically cutting out shortly before the baking temperature is reached. Another newcomer is the type VS thermostat designed for controlling automatically fired boilers and similar applications. No. 23.



(Above) Airmec's new 5 kVA automatic voltage regulator type P851 for 210 to 240 V



(Left) A flameproof fluorescent fitting by Siemens Electric Lamps and Supplies for a 40 W lamp

Salford Electrical Instruments Ltd.

Included in the range of clip-on measuring instruments on show is a power factor meter, giving a direct indication, which is obtained by clipping the link round the current carrying conductor and connecting the wander-lead to the appropriate potential. The same link may also be used with indicators of G.E.C. link-testing ammeters, the voltage connection being ignored. Among other equipment in the display is seen the miniature a.c. link-testing ammeter, a self contained three-range rectifier moving coil instrument, and an a.c. load analyser. A special display of B.E.A. type, flush mounting panel instruments in also featured, these instruments having blade pointers and long scales. No. 88.

Wm. Sanders and Co. (Wednesbury)

For the switchgear specialist, the central feature of this stand is a cubicle type switchboard incorporating "Sandaclad" fused switches which were introduced at the beginning of the year. This unit is also being shown individually together with a range of this company's well-known light domestic gear which includes the 13A, rectangular pin plug in resilient rubber. No. 31.

Sangamo Weston Ltd.

Here the recently developed S.29 watt-hour meter provides a centre of attraction for meter engineers. Both single and polyphase models may be inspected, the latter being shown in both two element and three element models. Of the single disc pattern, they are housed in moulded "Bakelite" cases. Also on view is a representative display of Sangamo synchronous time switches and Weston electrical measuring instruments. They include rectangular and round type panel instruments, portable models, and laboratory standard and precision types. No. 39.

Santon Ltd.

This firm of electric heating specialists display an attractive range of products, of which their small thermal storage type water heaters are particularly interesting for the recent developments now incorporated. These involve internal arrangement of the heating elements, tests on which are still under way to ensure maximum efficiency in the modification. Immersion heaters are represented by a range of their "Otter" controlled types and examples of the dual controlled pattern. No. 44.

Siemens Group

Covering three stands, the Siemens Group of Companies, representing Siemens Bros. and Co., Siemens Electric Lamps and Supplies, and Alfred Graham and Co., exhibit examples of their manu-

B.E.P.C.

STAND No. **68**

BUT IN **1,000's** OF WAYS

WE CAN HELP YOU TO FIND THE RIGHT

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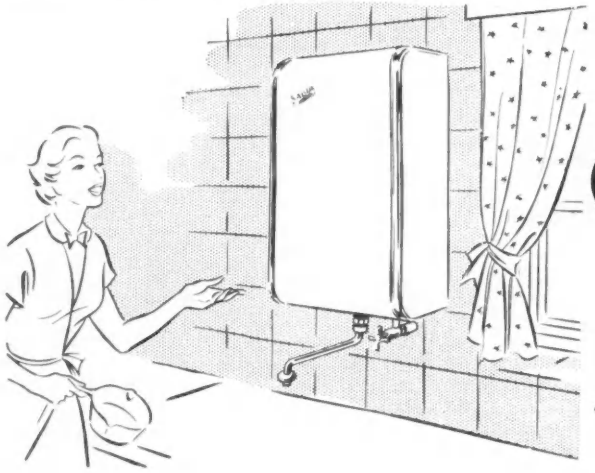
PRODUCTION FINISHES
AND
ELECTRICAL VARNISHES

Griffiths Bros. & Co. London Ltd.
MACKS ROAD - LONDON - S.E.16



we make ONLY electric water heaters *but* we DO make them WELL

The Sadia 'Select' is the latest product of the only specialists in electric water heating. 30 years of experience in this field are built into the Sadia Range of Electric Water Heaters, both large and small.

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DRIVER-HARRIS INTERNATIONAL GATHERING

Great Expansion of Nickel-Alloy Applications

A continuing expansion of demand in every sphere of their activity was the keynote of the 5th International Gathering of the Driver-Harris Organisation. It was shown that the rising intensity of demand for the Driver-Harris alloys was due both to the great increase in the fields of application of nickel-containing alloys and to the fact that a growing number of the newer applications demanded characteristics and qualities which can be met only by precise conditions of manufacture and testing such as are provided by the Driver-Harris Organisation.

The four-day Conference, organised by British Driver-Harris Co. Ltd., Manchester, was held at Alderley Edge, Cheshire, at the middle of May, and attended by a large number of technical and sales representatives from home and many countries abroad.

Through intensive discussion, augmented by a comprehensive collection of examples of the newer end-uses of many of the alloys, those attending the Conference were given an unmistakable picture of the patterns and the volume of demand.

The chairman of the International Conference was Mr. R. M. Parry, Managing Director of British Driver-Harris Co. Ltd., supported by Mr. W. M. Kay, M.Sc., A.R.I.C., technical director, and Mr. W. F. Marsh, production director of the firm, together with Mr. F. L. Driver and Mr. S. M. Tracey of the American company. In the photograph Mr. Parry is seen addressing the gathering at the farewell dinner.

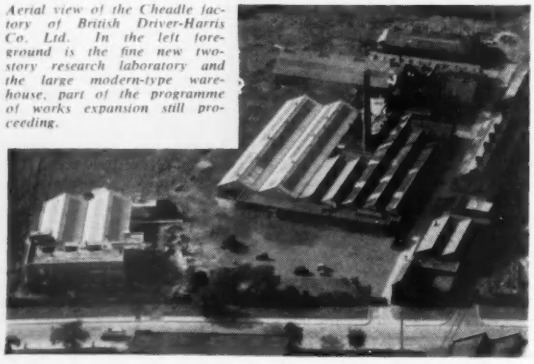
ADVANCED USES

The continually increasing application of electronics, in so many scientific and industrial fields, is a main source of expanding demand for specialised alloys in the manufacture of which the British Driver-Harris Company is pre-eminent. Similarly, a tremendous surge of new and improved designs in instruments, resistors and other electrical components, is being met by the expanded production of "Nichrome V", "Nichrome", "Advance", and other Driver-Harris nickel-containing alloys.

AN UNUSUAL SITUATION

Moreover, there are the specialised and often critical requirements of jet propulsion, guided missiles, and radar, to name a few of the advanced uses of nickel and other alloys in projects of a vital scientific category.

A substantial expansion of demand in those specialised fields, is having the effect of contracting the possible sources of supply of alloys having the required qualities.



Aerial view of the Cheadle factory of British Driver-Harris Co. Ltd. In the left foreground is the fine new two-story research laboratory and the large modern-type warehouse, part of the programme of works expansion still proceeding.

WHAT IS BEING DONE

By means of a carefully-phased programme of works and research extension, British Driver-Harris Co. Ltd. are abreast of the situation. It is thus that they are able to meet an expanding demand for alloys for well-established applications on electrical resistance as well as the additional production required by the newer and more specialised uses.

The latest additions at the Cheadle factory of British Driver-Harris Co. Ltd. include several new wire shops and new plant to expand the output of super fine wires in "Nichrome", "Nichrome V", "Advance" and "Karma" alloys. Another fine new building is a two-story research laboratory (seen at the left in the aerial photograph). The laboratory, now almost ready for occupation, will provide much-needed extra capacity for research and testing.

BRITISH DRIVER-HARRIS CO. LTD

MANCHESTER 15

"NICHROME"

facture ranging from telephone apparatus to industrial units. A useful development is seen in a new method of steel racking which can be used for cable supports, conduit fixings, pipes and similar material. Known as the "Sierack" system, it comprises standard lengths of channelling capable of being assembled into any desired formation for carrying cables or similar duties. No holes need be drilled on site, all that is required being a hacksaw for cutting the channelling to length and a spanner for tightening the special spring loaded nuts and bolts provided. Nos. 10, 11 and 12.

Siemens-Schuckert (Gt. Britain) Ltd.

On public exhibition for the first time is an ironclad dis-board type IDS, with automatic double and triple pole circuit-breakers incorporating core balance earth-leakage protection. The earth leakage system comprises a small core balance transformer carrying the main current, its secondary winding being energised only in the event of an earth fault on any phase, thus operating a relay which trips the breaker. A red disc then appears behind a small window in the cover of the unit to indicate the breaker having tripped on an earth fault. A special key is required to reset the breaker, although on tripping due to overload or short current it can be restored by reclosing the handle. To complete the display are two spot welding machines. No. 52.

Simplex Electric Co.

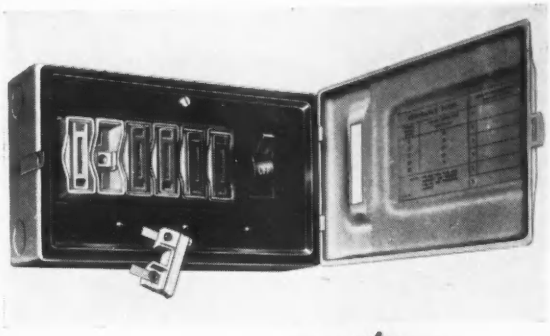
With cookers suitable for every purse and home, the "Creda" cooker display includes the new "Star" cooker introduced recently, the "Super Comet," which incorporates time switch clocks and dials, the "Comet" and the cabinet model "EV.13." Two models of the "Star" are available, the 310 having two boiling plates, 6¼ in. and 8 in., together with a grill-boiler as its standard hob equipment. An extended hob, complete with towel rails, can be supplied as an extra. The 305 model of the "Star" does not have the 6¼ in. boiling plate nor provision for the extended towel rail, although conversion to a 310 model is stated to be simple and inexpensive. No. 46.

Smith Meters Ltd.

A complete range of meters made by this firm is to be seen, the display including the now well-known type APR prepayment meter. Also on show are the type AM maximum continuous rating pattern, and polyphase meters with and without maximum demand indicators. As a background to the display are photographs depicting sections of the company's works showing the equipment needed for the manufacture of house service meters. No. 81.

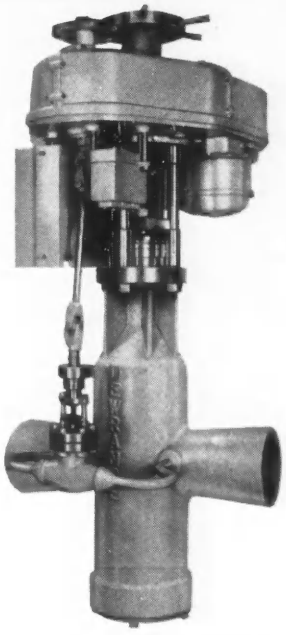
Smith's English Clocks Ltd.

Such is the growing popularity of electric clocks that in the foreseeable future, public preference for electric clocks may outstrip that for handwound types. The display of "Sectric" clocks indicates some of the models available, three popular models being the "Morville," "Morton" and "Morling." All are in handsome wood cases, the former being of walnut with a gilt bezel and Arabic gilt zone. The other two models have cases in oak, the "Morton" having a gilt bezel and cream zone and the "Morling" a chrome 4 in. dia. chrome bezel and Roman numerals. No. 42.



Consumer's six-way switch and fuse chamber fitted with rewireable fuses

Dewrance and Co. have this new 8 in. parallel slide valve complete with electrically operated valve equipment



South Eastern Electricity Board

Seeboard's stand is designed to give visitors a bird's eye view of typical parts of the Board's area and activities. Representing rural supplies is a display made up from aerial views of Kentish hop gardens, whilst similar pictorial views of a seaside resort and cement works illustrate commercial and industrial consumers. Selected industries, such as gypsum mining, automatic tile manufacture, and cerium processing are displayed by means of photographs and sample products. No. 100.

South Wales Switchgear Ltd.

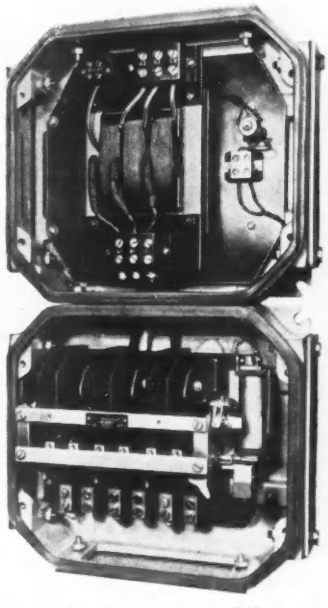
A particularly eye-catching display on this switchgear stand is a model of an outdoor substation employing outdoor type metalclad switchgear for both 11 kV and 33 kV circuits, the design of the latter being a notable departure from orthodox practice. Of their products, a 400 A, 250 MVA rupturing capacity, metalclad current-breaker unit is to be seen. Of the air insulated type, it is designed for vertical isolation whilst the c.b. is oil immersed operated by a spring closing mechanism. No. 32.

Standard Telephones and Cables Ltd.

An essential link in h.v. transmission systems is the underground power cable, and Standards are portraying in diagrammatic and model form the simplicity of operation of a typical 132 kV oil-filled cable system and the ease with which it can be accommodated to bulk power transfer requirements. The model installation simulates the movement of the oil in the cable under varying load conditions, indicating the manner in which the oil expansion is maintained within specified limits. No. 60.

Sunvic Controls

Visitors to this stand may inspect a variety of "Sunvic" domestic controls, a notable exhibit being the type TQB water heater thermostat recently introduced to



Siemens-Schuckert single unit S12 t.p., c.b. with core balance earth leakage protection

meet a demand for a simple and lower priced instrument. Of the immersion type, it has a fixed temperature setting and, moreover, is capable of being withdrawn for cleaning or inspection without draining the hot water system, a convenient feature. It is compact in size—overall length 5¾ in.—and is supplied at a standard setting of 140° F. No. 78.

Telegraph Construction and Maintenance Co.

"Telcon's" cable division provide this display, which ranges from plastic insulated types for l.v. systems to 22 kV paper insulated cables. For use in rural areas is a new type of 11 kV polythene insulated, self supporting aerial cable shown with appropriate fittings. Polythene insulation is also featured in the 11 kV power cable of the type recently installed at the Queen Elizabeth oil dock at Eastham. Power cables of all types for pressures up to 22 kV are shown, with copper or aluminium conductors and lead or aluminium sheaths. No. 69.

Thorn Electrical Industries Ltd.

Featured on the "Atlas" stand are pictorial views of Rye House generating station, the first to be illuminated throughout with fluorescent lighting, much of which involved "Atlas" equipment. Visitors may carry out colour comparison experiments with their "double-life" fluorescent tubes and tungsten filament lamps, an adjoining display giving suggestions for their respective uses. A number of fittings in functional use are notable, particularly the "Pin-up" fitting which is eminently suited to domestic local fluorescent lighting and one of the new "Troffer" units which will be available in the coming season. No. 51.

Tricity Cookers Ltd.

Among the display of electric cookers is seen a newcomer in a model priced between their "Queen" and 528 models. Several interesting features are likely make this cooker of wide appeal. For the luxury kitchen, the Tricity "Queen" is a particular suitability, its automatic control an asset for the working housewife. No. 50.

Vactric Ltd.

For housewives who prefer upright vacuum cleaners the "Vactric" model R.53 will have an undoubted attraction. Two features of note are the height adjusting screw, which varies the height of the nozzle for carpets of varying piles, and the "vibro-action" method of cleaning in which an air cushion is formed under the carpet below the nozzle to ensure efficient cleaning. The cylinder type cleaner, however, is not ignored, the model W.202 being shown, complete with accessories for off-the-floor work. No. 43.

J. and H. Walter Ltd.

Where users regard the flexible cord attached to smoothing irons as a source of inconvenience, the "No-cord" electric ironing unit shown here is an ideal alternative. The unit comprises special ironing board, with a sloping well at one end into which the iron rolls. The plug on the iron connects with a socket outlet in the well, which is provided with a spring catch arrangement to lock the iron in place when the work is completed. Whilst the iron rests in the well, its element is automatically connected to the supply through the socket, a variable thermostatic control guarding against overheating, and enabling the temperature to be adjusted for different materials. No. 95.

Wego Condenser Co.

For single phase motor designers, there is a representative display of capacitors for motor starting, whilst other patterns are shown for radio interference suppression from neon and fluorescent lighting, and other applications. High voltage capacitors are shown suitable for impulse testing, X-ray circuits and similar uses. An important application of capacitor units is in power factor connection, the "Wego" range being displayed together with a working model showing the reduction in motor line current as capacitance is successfully applied. Illustrations of special designs produced to order for such purposes as delay lines, pulse forming networks and research are also on view. No. 21.

Henry Wiggin and Co.

One of the principle activities of this long established firm is the supply of high grade electrical resistance materials, many examples of which are displayed. From the basic 80/20 Ni-Cr. alloy introduced some 30 years ago have been developed a variety of grades to meet operating conditions which differ in heating, atmosphere and frequency of use. Known as the "Brightray" series, they include such latest additions as "Brightray F" designed for furnace elements operating in carburizing conditons. Where the resistance temperature does not exceed 300°C, the Ni-Cu alloy "Feroy" has a wide variety of applications in electrical control gear and instruments. No. 48.

Wilkins and Mitchell Ltd.

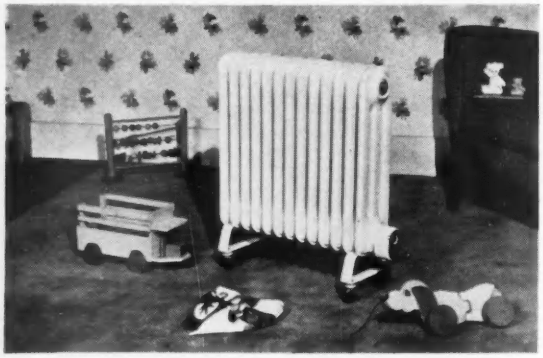
Of the variety of washing machines on display on the "Servis" stand, the latest, model S, is sure to attract considerable attention. Attractively styled, it is a convenient size for the modern kitchen where space is at a premium yet large enough in its capacity (approx. 4lb dry clothes) for the average family. Having a low geared hand wringer for easy operation, it is electrically heated and fitted with a pump for emptying. Two newly styled refrigerator models are also shown, the smaller 3·9 cu. ft capacity unit having a full length door to cabinet. No. 45.

Yorkshire Switchgear and Eng. Co.

The main exhibit here is a non-extensible ring-main unit incorporating two fault making isolators and an automatic oil circuit-breaker which is replaceable by switch fuse gear having trip or phase features. The o.c.b. is shown fitted with the recently developed arc trap. Industrial "Y" switch and switch fire gear for 660 V service and ratings up to 1,000 A is also shown. No. 71.

Making its debut at Eastbourne is Chilton Products new universal shaver conversion kit

The stylish English Electric 2011 "auto-cooker" blends well with modern kitchen schemes



Hurseal's new TV3 radiator is safe in the nursery

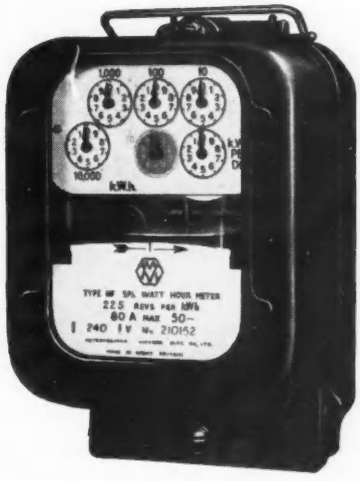
Count Seven . . .

and choose the

METROVICK

TYPE NF Watt-hour Meter

Exceeding the already high standards of meter performance today, the type NF watt-hour meter is the result of demand for even wider domestic load ranges. Built to give many years of sensitive and dependable service, its design incorporates the following seven important features :



- *High degree of accuracy over wide range of loads*
- *Complete temperature compensation*
- *Damping system giving complete stability*
- *Simple and accessible adjustments for calibration*
- *Resilient lower (jewel) bearing*
- *Easy dismantling for maintenance*
- *One terminal block for all capacities*

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Member of the A.E.I. group of companies

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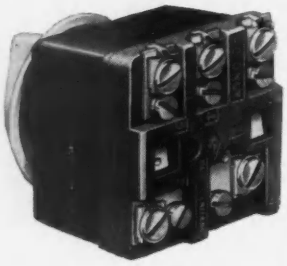
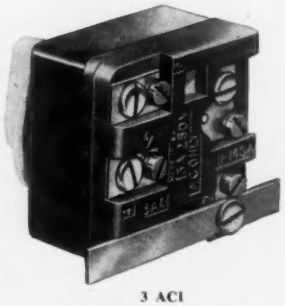
ELECTRICAL CONTROLLING DEVICES



4 AC1
D.P. 3 heat rear wiring 1¼" deep. Designed to conform with European specifications.



3 AC1
S.P. 3 heat 1 7/16" max. rear projection. Arranged for horizontal R.L. Bus-bar wiring.

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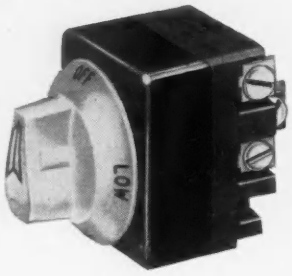
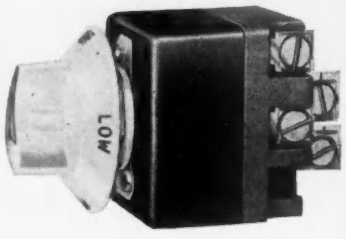


5 AC3
S.P. 3 heat for standard side wiring. Max. rear projection 2 1/16"



7 AC3
S.P. and D.P. 3 heat, rear projection interchangeable with existing Q.M.B. types.

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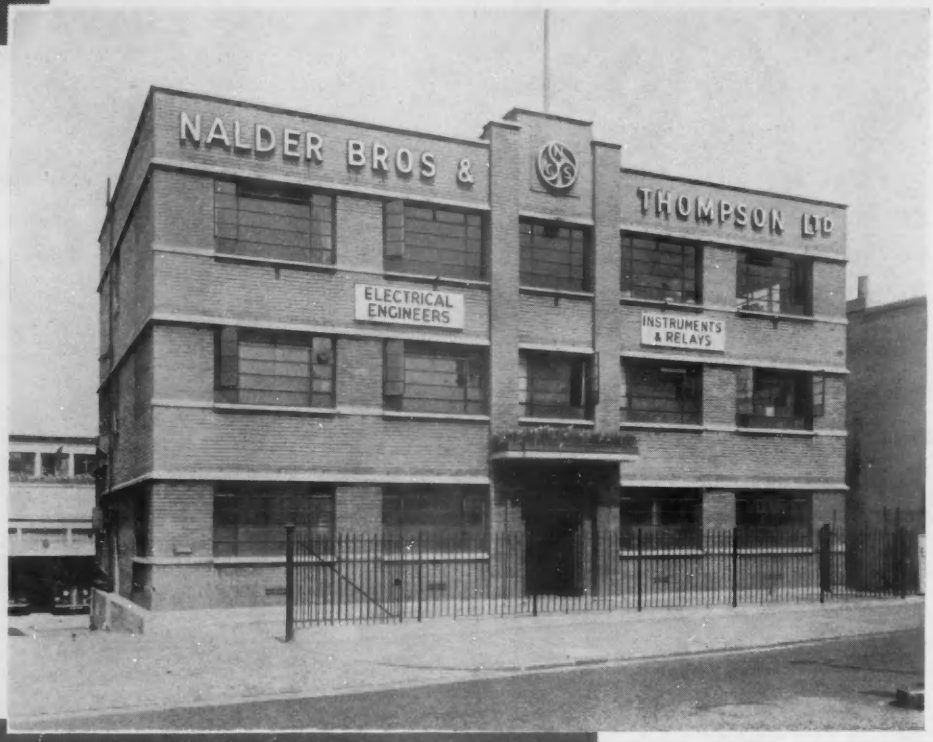

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From an engineer's notebook

IN the days when I was an enthusiastic collector of cigarette cards, I remember illustrated in a series of cards on modern inventions, a large structure not unlike a searchlight which directly utilised the heat of the sun for the generation of steam. The pursuit of something for nothing has gone on ever since, though I did think a halt would be called after the survey published a few years ago which offered a solar cooker for the tropics as the best hope of exploiting the suns rays. But no: still new ideas are forthcoming. From the Bell laboratories has come a group of silicon photo-cells for the direct generation of electricity from sunlight for the operation of telephones in rural areas. It is said to have an output of 50 W per sq yd of surface but even with this surprising output it will not take us very far. Far more imaginative in character is the suggested use of solar energy to assist in the propulsion of rockets for interplanetary travel. The need for a compact power source obviously led to the proposal of atomic power but this of course would give rise to its own special problems. The temperatures generated would be excessive and the provision of adequate shielding in a design where space was at a premium would prove well nigh insoluble. The proposal now put forward is to use a solid high temperature propellant, ignited by solar energy, as the means of propulsion. An image of the sun, smaller in diameter than the combustion chamber, is projected through a fused silicon window on to the high temperature propellant. This would provide sufficient temperature for ignition and the rods of solid propellant would automatically be fed forward as they burned. Such a means of propulsion, it is claimed, would decrease the weight of fuel to be carried and simplify the equipment. All these methods may be excellent but those of us reared in the vagaries of a British climate must be excused a distrust in the merits of solar energy.

* * *

A NEW form of ultra violet microscope I saw recently described, interested me as much for its implications as for the scientific technique employed. Like all other ultra violet microscopes this uses rays beyond the visible range in order to obtain greater powers of resolution. The unusual features of this particular instrument is the reproduction of the image in three colours and by this means a greater appreciation of the object can be obtained, with magnification up to ×5,000. The actual procedure is straightforward. Three separate photographs are taken at differing preselected wavelengths in the U.V. region down to 2,300 angstroms. These negatives are processed and then projected through coloured filters to form a composite coloured image on the translucent screen. All the processing is provided for within the instrument which automatically produces the coloured image within about one minute. The U.V. light source used is a h.p. water cooled mercury arc. What appeals to me about this system is the absence of any existing code of colour; no kind friend can say like they do of my colour films, "a very good picture but the colours aren't quite natural." Since there are no visible colours in the U.V. region, the operator is free to please himself what wavelength he uses for the separation negatives, and the "right" colours will be those which bring out the greatest amount of information about the object photographed. Perhaps if this technique proves sufficiently attractive, our film manufacturers will one day produce range of three colour films sensitive to selected very short waves, thus providing a new research tool.

* * *

IT is many years since I first saw a demonstration of photo-elasticity. It was a display of two gear wheels of transparent plastic material and when pressure was applied between them I was amazed at the multi-coloured stress pattern produced by the change in the optical properties of the material. Surely, I thought, never has a scientific method been so straightforward in its approach and at the same time so artistic in its presentation. Since then I have from time to time seen the technique in use and the introduction of freezing the stress in the material for subsequent detailed analysis. None the less it came as a surprise recently to find the extent to which such methods have developed. There is now a whole corpus of studies on photo-elasticity that from the simplicity of the initial concept the technique has grown in scope and application until it has surely now reached the status of a separate specialised subject. A wide range of plastic materials are available to the investigator, each with their specialised characteristics. Different techniques are available for dealing with the many different problems encountered and new developments appear to be taking place with considerable rapidity. Above all the method has the advantage that those of us who are uninitiated in the practical means employed can obtain some quick appreciation of the stresses in an object from those photos of stress patterns which have a fascination all their own.

* * *

ELECTRICAL engineers seldom have to seek out information on lighting, I feel it is almost true to say they have it thrust upon them for there is probably no section of the electrical industry so well documented. Our friends the lamp manufacturers have ensured that information is freely available on seemingly all technical aspects of the subject: so I was interested to come across one factor about which little has been heard; it is the effect of light in causing colours to fade and paper and textiles to crumble. A recent investigation has been carried out in America in this particular field as an extension of previous work having the exalted object of preservation of the original copies of the Declaration of Independence and the U.S. Constitution. The investigation covered the range of wavelengths from 3,000 to 6,000 Angstroms since this embraced the sources likely to be utilised and resulted in the surprising development of a formula from which could be computed the probable rate of damage per ft-candle. Six light sources were studied, the sky, the sun, cool-white, warm white and daylight fluorescent lamps and the incandescent lamp. The hazard from a bare incandescent lamp was considered negligible but even better was the cool-white deluxe fluorescent lamp when used with a particular filter cutting off the short wave part of the spectrum. The filter used had a negligible effect on colour and in consequence the use of this combination was able to provide excellent colour rendition with a minimum risk of deterioration of precious documents.—*E. R. G.*

Extruded Aluminium Sheaths for Power Cables

ONE of the most significant advances in the technique of cable manufacture has been made at the Prescot Works of B.I.C.C. The installation of a unique press now makes possible the continuous extrusion of aluminium for power cable sheathing to any desired length. Satisfactory welds between billets and the elimination of weakness at "stop-marks" mean that commercial grades of aluminium can now be used to provide sheathing to fulfil all required conditions. The characteristics of aluminium sheaths for power cables are well known, and in Great Britain there is already wide experience of cables with sheaths produced by the tube-sinking method.

Direct extrusion of aluminium sheaths has long been of interest to the cable maker. During the past 25 years or more numerous efforts have been made to develop the process, but only of late have there been prospects of practical success.

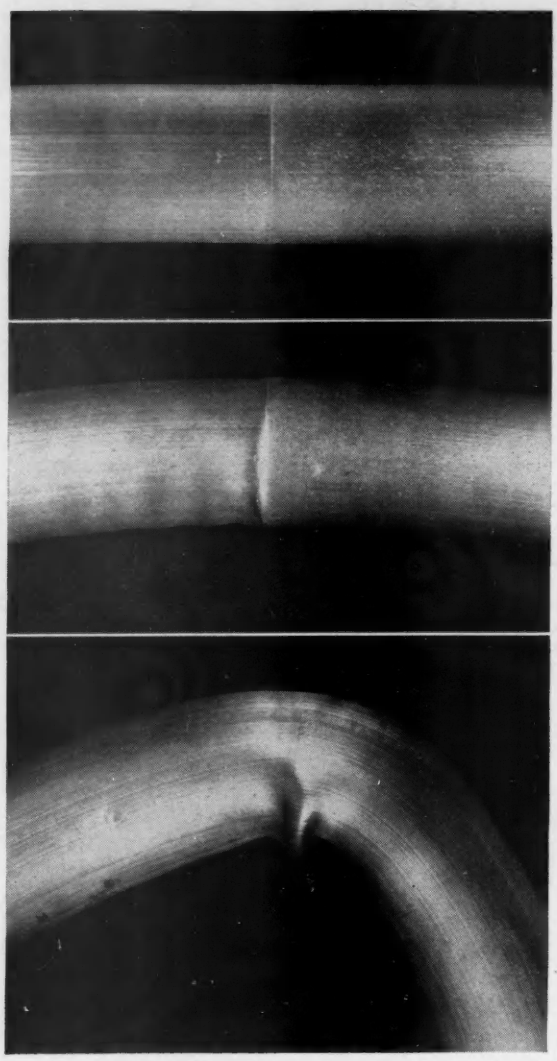
After close study of the problems involved, and after much preliminary experimental work, B.I.C.C. concluded some few years ago that the following conditions must be satisfied if the extrusion of aluminium sheaths is to take its place as a normal production process: (*a*) commercial grades of aluminium should be used; (*b*) solid billets were essential; (*c*) temperatures should be low, preferably not exceeding 300° C; (*d*) the ability to produce sheathed cables in long continuous lengths, was of importance; (*e*) satisfactory welds between successive billets; (*f*) minimum charging time to prevent overheating of the cable while stationary in the press; and (*g*) avoidance of deformation and metallurgical features at "stop-marks" (i.e., the point on the sheath which is within the die when the cable is stationary for recharging).

No existing type of press was available combining all these features. Accordingly, B.I.C.C. and the Loewy Engineering Co., Ltd., co-operated in the development of an extrusion press which would provide the facilities required. The result of their combined efforts is the Alsheath Press, made by the Loewy Engineering Co., Ltd., and installed at Prescot, and which is the subject of patents and patent applications in Great Britain and abroad.

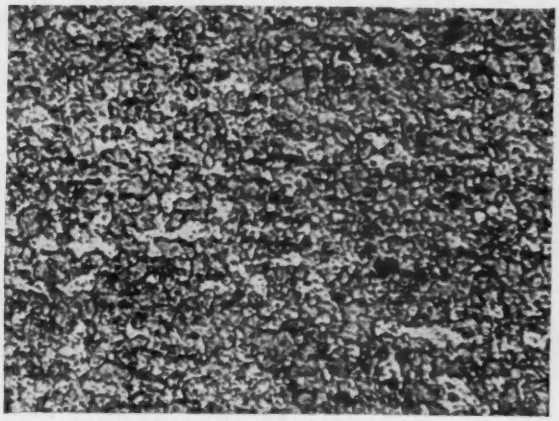
This press is believed to be unique. It is hydraulically operated with two horizontally-opposed cylinders each 45 in. in diameter, operating at 4,280 lb/sq in. pressure, and each giving nominally 3,000 tons capacity. Twin billets are extruded through a common core and die to give sheaths ranging from 1·4 in. to 3·5 in. diameter.

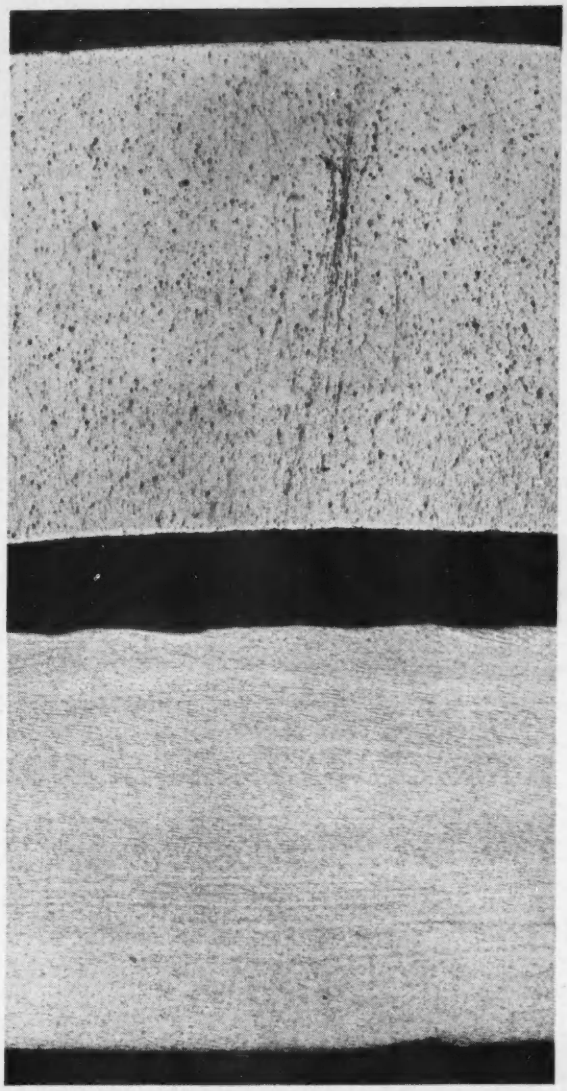
The cable passes through the press at right angles to the axis of the cylinders. This permits the use of solid billets and reduces to a minimum the length of cable exposed to the heat of the press. The extrusion tools are mounted in such a way that they retain their positions and the gap between them remains constant, independent of elastic deformation due to expansion or contraction under heat. The extruded sheathings are, therefore, free from weakness at "stop-marks." Special controls ensure that the speed of extrusion from the two containers is constantly balanced. Mechanical loading facilities have brought down the recharging time to a matter of seconds. Special attention has been devoted to the prevention of air inclusions. All major movements are controlled by servo-operated valves from a central pulpit providing for fully-automatic control or for individual control as desired.

Trials to date indicate that all the initial objectives are being met and the press is approaching the stage when it will take its place as a routine tool in cable manufacture. Enough cable has been sheathed to show that the "stop-marks" are satisfactory from the dimensional and metallurgical aspects; they comply with the appropriate bend



Top : The stop-mark position. Centre : The stop-mark after subjection to bend tests involving four bends over mandrel of 24 times tube diameter. Bottom : Excellent mechanical strength is shown in this photograph of the stop-mark tested to destruction



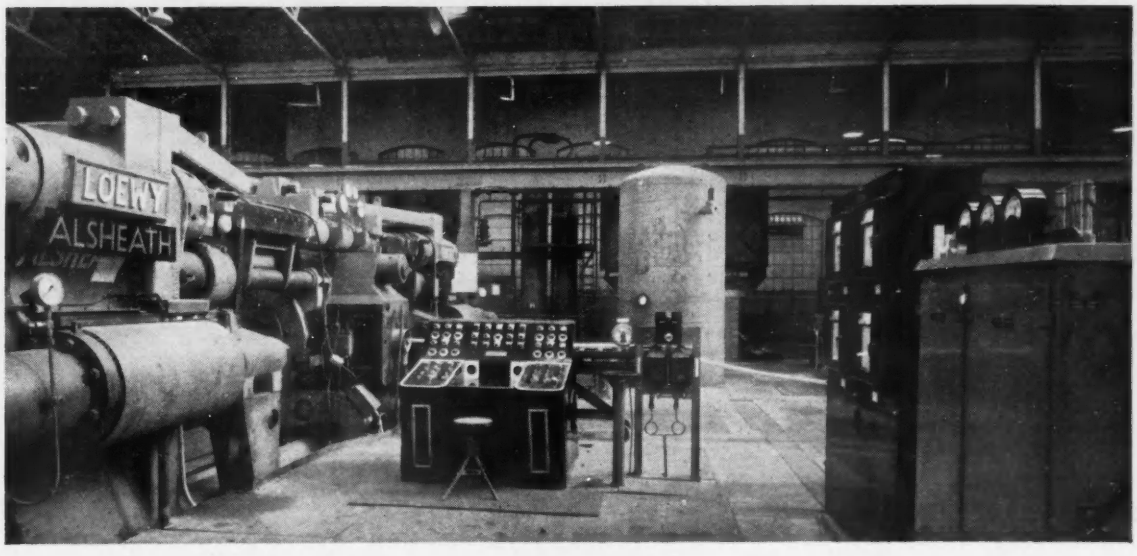


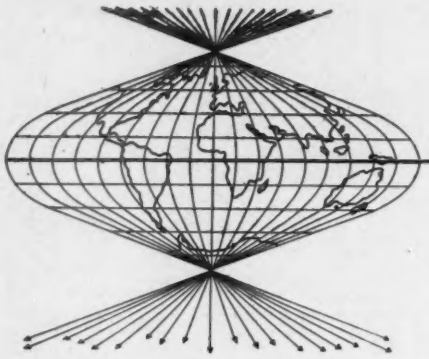
Above: A Photomicrograph (×200) of longitudinal section of the tube showing fine grain. Right: Photomicrograph (×30) of transverse section of tube showing seam features at top of position, and photomicrograph (×30) of longitudinal section of tube through stop-mark confirming absence of grain. Below: view of press and control desk

test requirements and they can withstand high hoop stress. The welds formed between successive billets (as distinct from "stop-marks") are not discernible in the extruded sheath.

With aluminium of 99·8% purity and extrusion temperatures of 280° C, the extruded sheaths are in the lightly annealed condition. Tensile strength is 5·0 to 6·0 tons/sq in., and elongation on a length of two inches in the longitudinal direction of the sheath is 30% to 50%, depending on diameter and thickness. The grain size is fine at all parts of the sheath including "stop-marks." These properties ensure that the springiness associated with cold working is largely eliminated.

Much remains to be done in equipping the press with the tools required for a comprehensive range of cable size and in proving its performance over that range. Sufficient has been done, however, to indicate that here we have a thoroughly practical solution of the problems which have engaged the attention of cable makers and of press designers for many years, and it is gratifying to know that British technique and British workmanship have been responsible for this outstanding achievement.





OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Order for Manitoba

The Metropolitan-Vickers Electrical Co., Ltd., have received an order valued at over $1 million from the Manitoba Hydro-Electric Board, for the supply, manufacture and installation of two 33 MW steam turbo generator sets. The order was obtained in the face of competition from the U.S., Switzerland and other countries. We understand these sets are for the new power station at Brandon, to which we earlier referred. The sets operate on inlet stream conditions of 600 p.s.i.g., 825° F. Both are to be commissioned by mid-1957.

Atomic Power

Returning from a five-week tour of Europe during which he studied atomic power and hydro-electric developments, Mr R. H. Saunders, chairman of the Hydro-Electric Power Commission of Ontario, has said that the Commission will be one of the first publicly owned utilities to incorporate atomic power into its system. But he had no expectation that the atomic experiments would ever produce cheaper electricity than hydro power, although it might be cheaper than the present day steam plants. During the debate in the House of Commons at Ottawa last week on an amendment of the Atomic Energy Control Act to stimulate development, Mr Howe, Minister for Trade, said atomic power stations would help Canada to develop the power capacity of 40 million kW needed by 1979. The amount of hydro-electric power which would be developed by then would by itself fall short of the target by 10 million kW.

Ottawa's Results

With rising costs and new demands for services the Hydro-Electric Commission of Ottawa is nearing the end of its heavy surplus, the Commission's report just issued, shows. For the year ended 31 Dec. last there is a net operating surplus of $565,476 compared with the 1952 surplus of $754,724. The cost of power, purchased from the Hydro-Electric Power Commission of Ontario and the Gatineau Power Co., increased by 12·79% during the year, while revenue rose by 6·15%. Since 1953 the Commission has been putting aside about $75,000 as a Rate Stabilising Fund against the expiring of their favourable contract with the Gatineau Power Co. in 1968, by which time it should amount to $1½ millions. With a further 2,336 consumers connected the Commission is supplying 64,227 consumers. Mr S. Lewis, Chairman of the Commission, states that underground mains are being laid wherever feasible. Two underground conduit systems were started last year, and when completed, with other installations on Main Street, there will be 143,000 ft of duct lines in the city. During the year Mr F. G. York became general manager and chief engineer of the Commission in succession to Mr G. R. Davis who moved to Kingston.

Seaway Orders?

Canada will encourage as far as possible the buying of British materials for the St. Lawrence Seaway project, Mr St. Laurent, the Canadian Prime Minister, declared last week. Questioned whether the Government would give consideration to U.K. tenders to help provide Britain with dollars to buy Canadian goods, he said the St. Lawrence Seaway Authority had not yet been set up, but it was the Government's policy to encourage to the greatest possible extent imports from the U.K. An important part of the project is the hydro-electric development, to be undertaken jointly by the Hydro-Electric Power Commission of Ontario and the New York State Power Authority, planned to produce 2,200,000 h.p.

WEST INDIES

New Station For Jamaica

The Jamaica Public Service Co. Ltd., have placed a contract with the Harland Engineering Co. Ltd., for the generating plant for its new Rio Bueno hydro-electric station, Jamaica. There is to be one Harland 2,940 kVA 3-ph. 6·9 kV, vertical shaft generator driven by a 3,550 b.h.p. Harland-Morgan Smith Francis turbine operating under a head of 205 ft. The turbine will be protected by a 36 in. dia. Harland-Morgan Smith Rotovalve. As in the case of the Jamaica P.S. Co's Lower White River power station where a 6,700 b.h.p. unit was installed by the Harland Engineering Co., the Rio Bueno set will be designed for a frequency of 40 c/s, but simply by increasing the speed it will generate current at 50 c/s when it is decided to change the frequency on the island.

AMERICA

The World's Largest?

Claimed to be ultimately the largest steam generating station in the world, the first 150 MW set has been put into operation at the Kingston station of the Tennessee Valley Authority. Located two miles north-east of Kingston, Tennessee, the station will eventually have nine generating units with a combined rating capacity of 1,440 MW. Operating at 80% load factor, the plant will burn over 4 million tons of coal annually.

EUROPE

Water Agreement

A convention concerning the use of the Drave River, whose waters flow successively through Austria and Yugoslavia, has been signed by representatives of those two countries. This agreement settles, with the aid of an annexed commercial contract, past differences on the use of water of the Drave River, and provides a regime for organising the flow of water from the Austrian hydro-electric central at Lavamünd to ensure supplies to Yugoslavia for hydro-electric purposes. The agreement was signed at the meeting of the Economic Commission for Europe's Committee on Electric Power. Discussions on the matter have been going on for two years.

Irrigation and Power

A dam and hydro-electric power plant are to be built at Porco Della Torre, on the Ticino River, in Northern Italy. The plant will be equipped with generators having a capacity of 14,000 kW. The dam will also make possible the irrigation of large tracts of land in the provinces of Novara, Vercelli and Pavia.

MIDDLE EAST

A Lebanon Scheme

A group of German companies has offered to finance and execute a hydro-electric project on the Litani—the most important river in the Lebanon. The estimated cost of the project is £11 millions. The offer was made to the

Lebanese Government by a German commercial delegation now visiting Beirut. A Point Four aid plan for the project is already under study and is expected to be submitted to the Government next month.

INDIA

More Power for Bombay

The first of three 18,000 kW turbo-generating sets in the extension of the Chola power station, of the Bombay Government, was put into commission recently. The second set should be operating shortly, and erection of the third unit is practically completed. The inauguration ceremony was carried out by Bombay's Chief Minister, Shri Morarji R. Desai, who pointed out that the extension was only a temporary measure designed to meet the growing demand for power in the Bombay-Poona region. The Government, he said, had begun work on the Koyna hydro-electric project, which, when completed would eradicate the power famine in the region. That project was expected to go into operation in 1960.

AUSTRALIA

New Station for S.A.

A new power station and transmission system to serve the lower south east region of South Australia, to cost about £5 millions, has been announced by the State Premier, Mr Playford. The new power station will be erected near Mount Gambier, about 250 miles south east of Adelaide. Mr Playford added that the Electricity Trust of South Australia was also considering establishing a second power station after the new Mount Gambier station was in commission. The second station would probably be at Lake Leake, near Kalangadoo. The Mount Gambier station, which would eventually have a capacity of 20 MW, was expected to be operating in 1956. Its boilers would be adapted to burn waste wood chopped in small pieces. Because of that, the cost of power should be comparable to those applying in the Trust's main system. The Trust has also decided to extend the main transmission line from Murray Bridge to Wellington and across the river to Tailem Bend, a distance of 25 miles at a cost of £50,000. This new line would serve about 150 dairy farmers along the route.

Likely H.E. Scheme

The Pieman River on the west coast of Tasmania is likely to be the source of future hydro-electric power, it seems. The State Minister for Lands and Works has said that the Hydro-Electric Commission of Tasmania had almost completed the installation of stream flow gauges at the Murchison and Macintosh Rivers. The two rivers meet near Tullah to form the Pieman River, and there was every possibility of the waters of the Pieman being used for future hydro-electric development. Any scheme built there would be some years ahead, but it was important that the Commission should obtain information concerning the amount of water flowing in the streams to enable it to plan for the future. Mr Reece said the Tullah district was in an area which had about an 80 in. annual rainfall, and it seemed that the Pieman River gorge would be suitable for large dam construction.

NEW ZEALAND

Water Heater Control

The Canterbury City Council, New Zealand, is considering the possibility of installing a water heating control system to save power at peak loads. The Municipal Electrical Department is now carrying out an investigation into the matter. This information is given in a report to the Canterbury Manufacturers Association. In this it is stated that since 1950 the Association's Fuel and Power Committee had tried to interest the Christchurch City Council to install equipment to enable all water heaters in the Municipal Electrical Department's area to be controlled by a ripple or switch control. The committee felt that the problem was a national one, and that the Manufacturers' Federation should take it up with the Government, which was faced with the tremendous capital cost of installing hydro-electric plant to carry peak loads. Some form of compulsory control over water heaters would be of great assistance to the country's economy, as it would spread the available power more evenly.

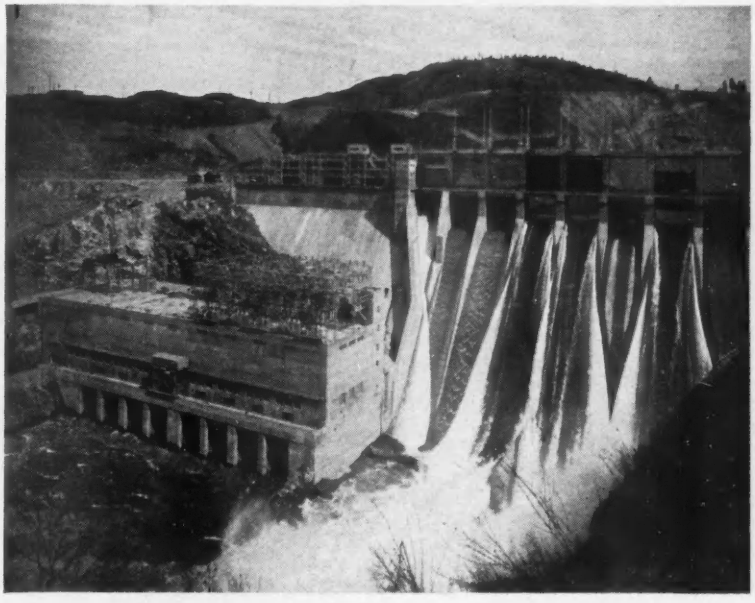
Hard Labour?

The revelation that the New Zealand Prisons Department had supplied labour for erecting power lines in the North Island, was made by an assessor in the Conciliation Council at Wellington, recently. He said that work on line extensions was being done by prisoners, under the charge of a prison warder, with no previous experience of the work. Work was immediately stopped by the Minister when he heard about it, but if it had not been for the action of the union it would probably still be going on. In this case the work was being done by a contractor.

FAR EAST

Survey for Station Site

The Thailand Finance Ministry has been authorised to allocate the sum of Baht 4 millions to the National Energy Commission, we learn. Of that amount, 3 millions will be utilised in making a survey in order to find a suitable site for a power station which would burn lignite. The balance of Baht 1 million is to be spent on the preliminary plans for the station.



A good example of power development by industrial concerns in Canada is the Waneta dam and power plant located on the Pend-d'Oreille River near its junction with the Columbia River in British Columbia. The Waneta plant, pictured alongside, built for the Consolidated Mining and Smelting Co. of Canada Ltd., was put into commission a few weeks ago. The station now houses two 105,000 h.p. turbines, each direct connected to 90,000 kVA generators, operating on a 210 ft head. Provision is made for the installation of two more units at a later date. Power is generated at 13·8 kV, stepped through 103·5 MVA three-phase transformers and transmitted at 60 kV. The dam is 950 ft long at the deck and 250 ft high from the riverbed, creating a lake 4 miles long. Stone & Webster Canada Ltd. were designers and project managers for the scheme. Waneta is the largest of Cominco's five hydro-electric installations near Trail, the home of the company's principal metallurgical and chemical fertiliser plants. It cost about $35 millions, plus a further $2 millions for the three 60 kV transmission lines from Waneta to Trail in addition to a switching station

Personalities IN THE INDUSTRY

Enfield Cables Ltd. announce that **Mr Rex Bate,** M.I.E.E., has been appointed sales director of the company, and will take up his new duties on 5 July. Since Jan. 1949, Mr Bate has been sales director of the Brush Electrical Engineering Co., Ltd. His early experience was gained with the Fuller Electrical and Manufacturing Co., Ltd., after which he served for three years in the Technical and Research Department of the Central Electricity Board. After a short period as resident inspecting engineer in Germany to the Brazilian Traction Light and Power Co., he became manager of the Calcutta office of Asea Electric Ltd., in 1937, and during the last war was commissioned in the Royal Indian Engineers, serving on the staff of the 14th Army. He joined the Brush Electrical Engineering Co. in February 1946, and was appointed general sales manager in the following year.

Mr A. G. W. Goulding has joined Alliance Wholesale Ltd. as manager of their Luton branch. Since 1946, he has been connected with the electrical side of the oil industry, but prior to his war service in the Army, he was departmental manager with the Sloan Electrical Co. Ltd. Alliance also announce that **Mr H. G. Wood,** who has been at their Luton branch for several years, is being transferred to the company's Croydon branch.

Resident tutor at the B.E.A.'s Horsley Towers Training Establishment since its inception in 1949, **Mr J. W. Graely** has been appointed deputy education and training officer at the Authority's headquarters in London.

The E.A.W. Diploma in Electrical Housecraft has been awarded to **Miss E. J. Jarvis,** London Electricity Board, Downham, and to **Mrs P. McCormick,** Eastern Electricity Board, Romford. Both gained a 1st Class pass in the cookery test, Miss Jarvis with distinction.

Mr M. J. Gartside, chairman and managing director of the Rheostatic Co., Ltd., recently left London Airport on a round-the-world business trip, lasting 10 weeks, during which he expects to travel over 30,000 miles. He will be introducing several new temperature control devices, which have recently been developed by the company with the requirements of overseas markets particularly in mind. Mr Gartside is first spending two weeks in Canada with the company's subsidiary, Satchwell Controls Ltd., in connection with plans for the expanding North American markets. He will then call on representatives in New Zealand and Australia, and then fly to South Africa to visit the company's subsidiary, Contactor (Pty) Ltd. Mr Gartside expects to return to England from South Africa during the second week in August.

Senior demonstrator for the Chester sub-area of the Merseyside and North Wales Electricity Board, **Miss Kathleen Piatt** is to leave Wallasey at the beginning of July to take up the post of senior sub-area demonstrator for the Worcester and District sub-area of the Midlands Electricity Board. Miss Piatt, it may be recalled, won the Caroline Haslett Travelling Trust in 1951 and visited Switzerland. In 1946 she was the winner of the Elizabeth Sloan Chesser Cup, obtaining the highest marks throughout the country in tests for the E.A.W. Diploma in Electrical Housecraft. Before going to Wallasey in 1946, Miss Piatt spent 3 years with the Newton-le-Willows U.D.C. undertaking, and with the Food Advice Division of the Ministry of Food.

Sharples Centrifuges Ltd. announce the appointment of **Mr M. E. O'K. Trowbridge,** B.SC., A.C.G.I., A.M.I.CHEM.E., as general sales manager of the company. Mr Trowbridge has recently returned from a tour of the company's operations in the U.S.A., where he has made a study of recent developments in separational techniques. He joined the company late last year, having previously been head of the Projects Initiation Department of Head Wrightson Processes Ltd.

The appointment is announced of **Commander C. M. Jacob,** D.S.C., A.M.I.E.E., R.N.(RETD.), as deputy technical manager of the Marconi International Marine Communication Co. Ltd. Commander Jacob's extensive naval experience dates back to 1923. Quite recently he was deputy captain superintendent of the Admiralty Signal and Radar Establishment, then naval adviser to the director of communications development at the Ministry of Supply, and finally, deputy chairman of the British Joint Communications-Electronics Board before joining the Marconi Marine Co.

Mr Rex Bate

Commdr. C. M. Jacob

The retirement of two area managers is announced by Siemens Electric Lamps and Supplies Ltd. **Mr C. M. Johnson,** area manager of Siemens' Belfast branch retired at the end of last month. He joined the Britannia Lamp and Accessories Co. in 1917, and when in 1920 that company was absorbed in the Siemens Organisation, he was transferred to Siemens Electric Lamps and Supplies Ltd. **Mr G. N. Armstrong** has been appointed area manager at Belfast in place of Mr Johnson whose services will still be available in an advisory capacity. **Mr E. A. Atkins,** area manager of Siemens' Cardiff branch, who has also retired, joined Siemens Brothers Co., Ltd., in June, 1908, and was transferred to Siemens Electric Lamps and Supplies Ltd. in 1931. For some years he was manager of the Battery Department and in 1948 went to Cardiff as branch manager. **Mr W. A. Cooper** has succeeded him as area manager for Cardiff.

Sir Cullum Welch, O.B.E., M.C., has joined the board of C. C. Wakefield and Co., Ltd. He has been the company's legal adviser for over twenty-five years. Sir Cullum succeeds upon the resignation of Mr H. Y. Blades, who has served Wakefields ever since their foundation fifty-five years ago.

For personal reasons, **Mr A. N. Rye,** M.I.E.E., has resigned his directorship of Lisbon Electric Tramways Ltd. He was chairman of the board during the seven difficult war years. To fill the vacancy, **Mr A. S. Roger,** M.B.E., has been appointed to the Board.

Mr. N. V. Baldwin, M.I.E.E., has been appointed managing director of Brookhirst Igranic S.A. (Pty) Ltd., the South African subsidiary of the Electrical Division of the Metal Industries group of companies. Mr Baldwin, well known in electrical circles in London and the West of England, has been connected with the Igranic Electric Co., Ltd., for more than 40 years, 19 as manager of the Company's Bristol office and, latterly, 7 as London office manager. He is a Past President of the Bristol Association of Engineers and a Past Service member of the Bristol Rotary Club, with which he has been connected for 17 years. During the war he served with the Royal Engineers and

Royal Corps of Signals, attaining the rank of Lt-Col. Mr Baldwin sails shortly to take up his appointment at 19 Link Road, Langlaagte, the Johannesburg office.

Mr G. B. G. Potter has been appointed to the board of S. Smith and Sons (England) Ltd. Mr Potter is managing director of Kelvin and Hughes Ltd., which became a fully owned subsidiary of S. Smith and Sons (England) Ltd., as the result of the latter's recent acquisition of the balance of shares in Kelvin and Hughes held by outside shareholders.

For the 1954-55 session, the London Students' Section of the I.E.E. has elected the following members of the Committee: Chairman, **Mr M. C. Cubitt,** of Pye Ltd.; vice-chairman, **Mr M. H. F. Collins,** of the British Thomson-Houston Co., Ltd.; and hon. secretary, **Mr K. W. E. Gravett,** M.SC.(ENC.), of the Post Office Research Station at Dollis Hill.

Under the terms of the scheme to commemorate the late Lord Rutherford of Nelson, the Council of the Royal Society has appointed **Dr E. Marsden,** C.M.G., C.B.E., F.R.S., of New Zealand, as the Rutherford Memorial Lecturer for 1954 (Dr Marsden is delivering a series of lectures at university centres in South Africa); and the Council has appointed **Mr D. M. Brink,** a graduate of the University of Tasmania, as a Rutherford Scholar for three years from 1 Oct, 1954, to carry out research in nuclear physics at the Clarendon Laboratory, Oxford.

The British Refrigeration Association announce that **Mr E. G. Batt** is no longer associated in any capacity with the Association.

Mr J. H. Christie, formerly of Lawson Turnbull Ltd., electrical wholesalers of Aberdeen, took up his appointment as lamp salesman with the British Thomson-Houston Co. Ltd. at Dundee this month.

Mr Robert Stewart, managing director of Andrew Stewart and Sons Ltd., electrical wholesalers of Palmerston North, New Zealand, is due to arrive in London late in July and will remain in Britain for approximately two months, we understand. Mr Stewart wishes to meet electrical manufacturers with a view to purchasing new lines not already established or represented in New Zealand, and with a further view to establishing agencies in the Dominion. Articles in which he is interested include vacuum cleaners, washing machines, motors, wiring accessories, conduit fittings, clocks, switchgear, and oil-filled radiators. Interested manufacturers should address all communications to Mr R. M. Stewart, c/o Bank of New South Wales, 47 Berkeley Sq, London, W.1.

Lord Citrine, chairman of the B.E.A., inaugurating the unique press at the B.I.C.C. Prescot Works for the extrusion of aluminium sheathing for power cables, to which we refer on page 868. Mr W. H. McFadzean, chairman-elect of B.I.C.C., is on the left

OBITUARY

Mr Norman Burton who died on 26 May, was senior partner in the firm of Norman Burton and Brother, of Manchester, which has represented the Micanite and Insulators Co., Ltd., in Cheshire, Lancashire and the West Riding of Yorkshire for 44 years.

Mr C. Jago, chief development engineer at Hoover (Washing Machines) Ltd., Merthyr Tydfil, died recently. Born at Portocatho, Cornwall, in 1915, Mr Jago joined Hoover Ltd. in 1942 as planning engineer in the production engineering department at the company's Perivale factory. He was one of the original members of the company's supervisory team who went to Merthyr in 1946 to prepare for the company's new enterprise there and played a noteworthy part in the growth and development of the factory at Merthyr.

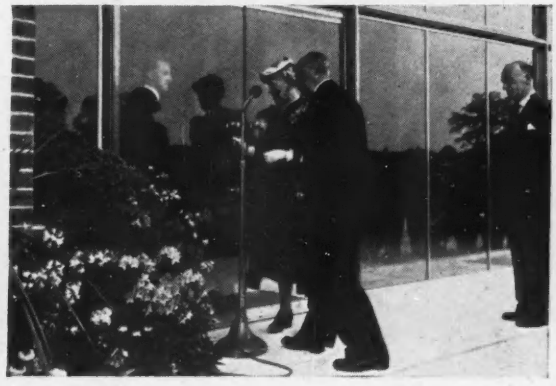
Wire Factory moves to Bracknell

ONE of the most modern and up-to-date wire works in the country was officially opened at Bracknell, in the beautiful Berkshire countryside around Ascot, on Wednesday of last week. The fortunate company is Kent Bros. Electric Wire Co. and E. H. Phillips Ltd.

Until now the company has occupied premises at Richmond, or to be more precise Kew; their trade mark being derived either from the name of the district or the company's initials. In common with many other progressive British organisations since the war, business has expanded at such a rate that larger manufacturing premises became imperative. We understand that there was a deal of uncertainty in the early days of planning the move, as to where the new factory would be erected.

That, however, was some four years ago, and in that time an impressive building has sprung up. The most attractive and sizeable single-bay factory offers seemingly ideal conditions to the firm's employees while they make the Kew covered winding wire and strip, for which Kent Bros. Electric Wire Co. and E. H. Phillips Ltd. are noted. Their wire is covered with a variety of materials—silk, art silk, cotton, paper and enamel, according to requirements. Nor should the administrative staff have any qualms about the palatial offices provided for them at their new home. Area of the buildings at present is nearly 80,000 sq ft although this will probably be increased by a further 40,000 sq ft later.

The opening ceremony itself was performed by Mrs E. H. Phillips, wife of the managing director. A special silver key was used for the purpose, and a plaque commemorating the opening was unveiled at the same time. After speeches by Mr E. H. Phillips, and the Hon P. F. Remnant, M.P. for the local constituency of Wokingham, the 200 guests made a tour of the works before adjourning for tea. The move should be completed by the end of June. Lighting in the new factory and offices was the responsibility of Metropolitan-Vickers Electrical Co., Ltd., and electrical contractors on the site were Barlow and Young.



Mrs E. H. Phillips, wife of the managing director, officially opens Kent Bros. Electric Wire Co. and E. H. Phillips Ltd's new factory at Bracknell, Berkshire

Equipment for Industry

Industrial Discharge Lighting

LATEST of the "Mazda" range of mercury vapour discharge lighting fittings is based on the efficiency, cleanliness and accurate optical control which can be obtained when standard, long-arc discharge lamps are mounted horizontally. Obtainable from the BRITISH THOMSON-HOUSTON CO. LTD., Crown Hse, Aldwych, W.C.2, the fitting incorporates improvements in both appearance and rigidity whilst at a lower price. It is available with or without magnetic arc control.

As in earlier fittings produced by this firm, the anodised aluminium reflector is easily detachable to facilitate maintenance. It may be removed in a few seconds using only one hand and without removing the lamp. As reflectors weigh only a few ounces each, a replacement stock sufficient for a whole shop may be carried on a cleaning round, the soiled reflectors being then removed to the maintenance shop for cleaning.

In profile, the reflector has been redesigned to improve the light distribution, which is now almost symmetrical where the separation between successive fittings does not exceed 1·2 times the mounting height. Although when used alone the fittings provide an economy of industrial mercury vapour lighting, they are also ideal for blended lighting installations where the additional filament lighting provides a measure of colour correction. The B.T.H. system for this type of lighting comprises a control box designed for either one or two discharge lamp fittings together with a tungsten lamp reflector. For mounting heights below 30 ft the latter requirement is suitably met by a standard vitreous enamel reflector but for higher bays the latest "Mazda" spun aluminium high bay fitting, low focusable with 500, 750, 1,000 and 1,500 W g.l.s. lamp is recommended.

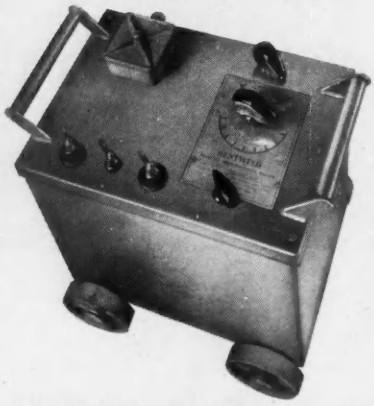
These recent "Mazda" industrial lighting fittings include the latest mercury unit top right, spun aluminium reflector for filament lamp top left, and two blended light fittings

"Rentweld" Arc Welding Plant

WHERE wide control of welding current is required, the latest "Rentweld" 450 A model arc welding unit provides the exceptional range of 120 different welding currents. Marketed by PRODUCTION PROMOTION, 94 Camden Rd, N.W.1, this model makes provision for two striking voltages. The higher potential, at 80 V, facilitates striking the arc when welding rusty work, sheet metal or when using special electrodes, 72 welding currents being available on this range. The remainder of the current values are obtained at a striking potential of 50 V, provided for heavy current work where it is advisable to minimise mains loading. At this striking voltage, the full output of the machine of 480A is maintained for a maximum duty cycle of only 14·4 kVA.

It is by incorporating the twin secondary windings typical of twin operator machines in a single operator unit that the wide choice of outputs is achieved. Effectively the new 450 A model is a twin version of the 240 A model (the smallest of the three now manufactured) housed in a single tank, with but one output control unit. This is the standard "Rentweld" type, comprising twin, spring-loaded, selectors. With the main selector, the desired current may be obtained instantaneously, the additional control give a fine variation of this main value.

Designed for use on two wire supplies of 400/415/440 V (any two lines of a three-phase supply) the "Rentweld" 450A welder is provided with input tappings to facilitate transferring to different voltage supplies, this being housed in the terminal box on the upper side of the tank.



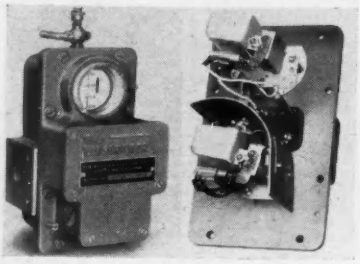
The "Rentweld" 450A model incorporates two of these 240A models with one control unit

Both the other two models, having maximum outputs of 300 A and 240 A, are similar in appearance and incorporate the same features of double striking voltages and rapid current selection.

Improved Buchholz-type relays

AN improved design of Buchholz-type, gas-actuated protective relay, developed by the ENGLISH ELECTRIC CO., LTD., Stafford, has recently been approved by the British Electricity Authority for use on contracts for oil-filled transformers. This type of relay is unique in that it detects incipient faults and, by giving an alarm, enables action to be taken before the fault can cause extensive damage to the protected apparatus. The relay is available, for 1 in., 2 in. and 3 in. pipework.

The "English Electric" Buchholz relay employs bucket-type operating elements so that the transformer can be vacuum-



Right is seen the improved Buchholz-type relay developed by English Electric

treated without damaging the relay, and faulty operation caused by punctured floats is prevented. Two operating elements are contained within the casing, the upper element operating an alarm when a certain volume of gas has been collected owing to an incipient fault. The lower element operates to isolate the transformer either on complete loss of oil in the conservator and relay, or when a more serious fault causes an oil surge.

Built-in Electric Cooker

DESIGNED especially to fit in an "English Rose" kitchen the ER94 Cooker has been designed by REVO ELECTRIC CO. LTD., Tipton, Staffs, in conjunction with C.S.A. Industries Ltd., of Warwick. With overall dimensions 66½ in. wide by 22 in. by 66 in. high, the unit seen in our illustration has a control panel at eye level and well out of reach of children. Under this, as is normal, is the eye level grill with drop door and three heat controls. The oven with internal dimensions 15½ in. wide by 13¾ in. deep and 14 in. high is controlled by

Designed for ultra modern labour saving kitchens the ER94 is the result of co-operation between Revo and CSA Industries

Revostat automatic regulator and equipped with automatic timer. Under this is a 17½ in. by 16½ in. by 4½ in. heated drawer and below this a larger cupboard for storing cooking utensils.

The hob unit at the right of the oven unit is a standard "English Rose" V20 floor cabinet and can be placed either left or right of the oven unit. Top surface is stainless steel with a 3 in. stainless steel backledge. Four boiling plates, one 8 in. and one 6½ in. solid plate with an 8 in. and a 6½ in. semi-radiant plate, all have "Simmerstat" control with separate switch for each on the control panel identified by coloured discs. These boiling plates are recessed into a rectangular cast iron hot plate in mottle enamelling.

Two drawers under the boiling plates each contain a drip tray which can be lifted out for cleaning whilst there are cupboards at the base of the unit. With a total loading of 9·7 kW the cooker unit is finished in "English Rose" cream.

G.E.C.'s new strip light fittings

TWO inexpensive but attractive fittings for the Osram 12 in. architectural lamp have been introduced by THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. The fittings are the F32078 wall fitting and a bedlight, F32079.

Selling prices are: wall fitting with lamp, £1. 3s. 6d.; bedlight with lamp, £1. 16s. 0d. Both fittings are insulated.

The wall fitting is made in cream or green moulded plastic and is specially suitable for use in bathrooms either above or on both sides of wall mirrors. It can also be used as a small ceiling fitting or decorative wall bracket.

The bedroom fitting has a cream plastic hood with spring clips for gripping a bed headboard or a dressing table mirror. It is wired complete with 9 ft. of flexible cable and cord-pull on-off switch.

A Raydair greenhouse heater

DEVELOPED from their well-known "Raydair" background heater is the new greenhouse heater by BERRY'S ELECTRIC LTD., Touchbutton House, Newman St, W.1.

Compact, waterproof, protected against rust and safe the new "Raydair" heater is loaded 750 W, measures 29 in. wide,

A Raydair for the greenhouse

20 in. high, and 3½ in. deep. It weighs 14½ lb. and is priced £7. 10s.

Used in conjunction with a thermostat the Raydair heater provides an efficient method of protecting young plants from sudden changes in temperature. Its combination of radiant and convected heat ensures an even distribution of warmth throughout the greenhouse. It has been found, say Berry's, that the slight concentration of heat immediately above and adjacent to the heater is most useful for propagation purposes.

A customer inspired Dairy Vehicle

THE new Morrison Electricar ED25 Dairy Vehicle announced recently by AUSTIN-CROMPTON PARKINSON ELECTRIC VEHICLES LTD., 95-99 Ladbroke Grove, W.11, is a unique example of collaboration between manufacturer and customer. During its development, principals, transport and dairy managers from eleven of the largest milk retailing organisations in the country were called in to examine and criticise prototype models. The production model meets all their combined requirements and suggestions.

The new ED25 vehicle

For the Electrical Trade

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The ED25 can be explained by an extract from the preliminary brief issued to the designers, "Get away from the conventional," they were told, "for pay-load capacity of 25 cwt and a price around £700 you must give extra ruggedness, exceptional accessibility for maintenance, low loading height, and good general performance."

The road safety qualities of this vehicle are outstanding and a typical example is the good driving visibility.

Overall length of the vehicle is 9 ft. 10 in. and width 4 ft. 10 in., yet the deck dimensions are 6 ft. 3¼ in. wide by 4 ft. 9 in. Turning circle is 27 ft.

Becker 13 amp Surface Socket

NEW development by GEO. BECKER LTD., Ampere Works, North End Rd, Wembley Park, Middlesex, is their 13 amp ring main surface socket List No. 4030, used in conjunction with the List No. 4000 fused plug.

The firm emphasise that they conform with the relevant B.S., are fully shuttered, robustly made in high-grade anti-tracking moulding powders, have specially designed contacts of high current carrying capacity and are supplied complete with two No. 6 by ¼ in. wood screws.

Both socket and plug are available in brown, cream or white at 45s. per doz list price for the socket, and 40s. the plug.

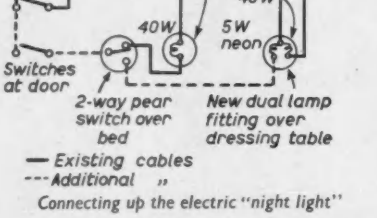
PROBLEMS AND PRACTICE

In Engineering

Electric Night Light

THE writer was asked to devise a wiring scheme to meet a special requirement in a bedroom of a dwelling house. There existed in the room two ceiling lighting points—one over the usual dressing table position controlled by a switch at the door, and one over the bed position controlled by a local one way pear switch dropped from the ceiling rose.

The requirement was that a "night light" lamp (5 W b.c. neon) be incorporated in the circuit, for use after other lamps had been switched off, as a small



Connecting up the electric "night light"

amount of light was required in the room during the hours of darkness. This could have been achieved by changing the lamp over the dressing table for the 5 W neon, night and morning, but this idea was dismissed as being undesirable. The "modification" was required to be carried out with as little as possible disturbance to the decoration of the room.

The existing wiring consisted of v.r.i. cables drawn into conduits—there being ample room in the conduits to accommodate the additional required cables. The accompanying diagram shows how the problem was overcome; and whilst it is realised the arrangement is open to criticism—it has proved extremely useful in practice.—*R. H. G. Holloway.*

To Save Time

THE information given in the note under the above heading in the May 6 issue infers that, on the failure of any one h.v. fuse, there are two l.v. terminals between which a zero voltage exists. Would it not be more accurate to infer that "On the . . . there is a minimum voltage when the l.v. side is on no load."

The result of opening one line on the primary side of a delta/star connected transformer is to apply a single-phase voltage across one phase and the same voltage across the remaining two phases in series. Normal voltage is induced in one phase of the secondary and the arithmetical sum of the voltages induced in the remaining two phases is equal to the secondary phase voltage. The actual proportions of the phase voltages induced in these remaining two phases depends upon the reluctance of the individual flux paths and will therefore be different for each design of transformers.

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Taking case 1, connection "a" in which the R phase h.v. fuse has blown, and assuming a nominal secondary phase voltage of 230 V then the secondary phase voltage of BN is 230 V. The secondary phase voltage of RN is more than 115 V due to the lower reluctance flux path. The secondary phase voltage of WN is less than 115 V due to the higher reluctance flux path. The voltage between the secondary line terminals R and W is equal to the difference between the secondary phase voltages of RN and WN. This difference is more than zero.

By similar reasoning it can be shown that, with h.v. fuse W blown, the voltage across secondary terminals W and B is zero. With h.v. fuse B blown, the voltage across secondary terminals R and B is more than zero.

Taking case 2 connection "b" the following conditions hold

H.V. line open	*Volts across secondary line terminals*
R	R and B more than zero
W	R and W more than zero
B	W and B equal to zero

It is appreciative that the writer of the article does mention a switch on the secondary side which switch, no doubt, ensures the secondary being on no load when the voltage readings are taken. I can, however, envisage circumstances where fuses only are used on the secondary side and where voltage readings can be taken when the secondary is on load. Under the latter conditions the majority of the voltage readings will appear to be all "haywire."—*E. A. Robbins.*

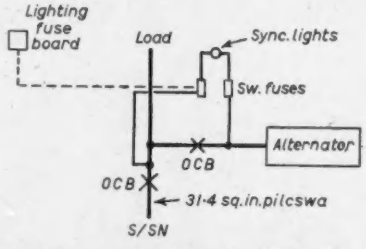
Supply Synchronising

RECENTLY a diesel alternator set was installed in our works. The installation was carried out by the makers' fitters, but the wiring was done by our own electricians.

When the work was completed the fitters ran the engine and asked us to give it a trial on load. We synchronised the alternator and switched a large machine bay from the mains to the alternator. After approximately two hours the fitters wanted to stop the engine. It was then that we noticed that the synchronising supply was taken from the dead side of the mains circuit breaker and the lights were, in effect, straight across the alternator circuit breaker and, of course, of no use.

Knocking off the supply of a large machine tool bay not only causes an interruption of work to many machine operators but, more important, spoils finishes and damages cutting tools if care is not taken when re-starting. Therefore we had to find an alternative. This we accomplished by bringing a temporary supply from a fuse-board close at hand and connecting it in the synchronising lights switch fuse. Feeling very pleased with the speed with which we got the lights working, we synchronised and closed the mains circuit breaker, and were astounded when it banged and both circuit breakers tripped out.

Since we had failed to execute a change over without stopping the supply, we closed the main breaker and awaited the storm of scathing remarks from the indignant operators, who were on a generous bonus scheme. While the fitters were checking the engine we managed to re-wire the synchronising circuit correctly and also to puzzle out the reason for the breaker tripping out.



This diagram shows how the synchronising supply was obtained from the wrong circuit

The fuse-board to which we had connected our temporary supply was a lighting fuse-board, the lighting circuit being fed from separate transformers to the power. The lighting transformers were connected delta/star, and the power transformers star/star, and hence at the time we thought we had synchronised the alternator to the mains there was a phase difference of 30° and a voltage difference of 120 V existing across the circuit-breaker.—*E. W. C.*

Portable Worklights.—Readers may be interested to know that a portable fluorescent fitting (serving a similar purpose to that described by "W.H.R." in our 13 May issue) is marketed under the name of "Portalux" by the Edison Swan Electric Co., Ltd.

NEWS OF THE WEEK

C.P.R.E. attack on Street Lighting

Resignation to Inevitable Overhead Lines and TV Stations

STREET lighting, power distribution lines and television transmitter stations were three items dealt with at some length in the 28th annual report for 1953-54 of the Council for the Preservation of Rural England. On the subject of street lighting, the Council particularly deprecates the fact that equipment tended to be chosen solely for its lighting efficiency and cheapness, and little or no thought was given to its day-time appearance. On aesthetic grounds the use of concrete for street lighting was deplored. The columns had a coarseness of texture which time did not mellow, and clumsy proportions which could rarely be assimilated to their surroundings, the report states. Both cast iron and tubular steel were far more sympathetic materials and it was to be hoped that they would be more widely used in future.

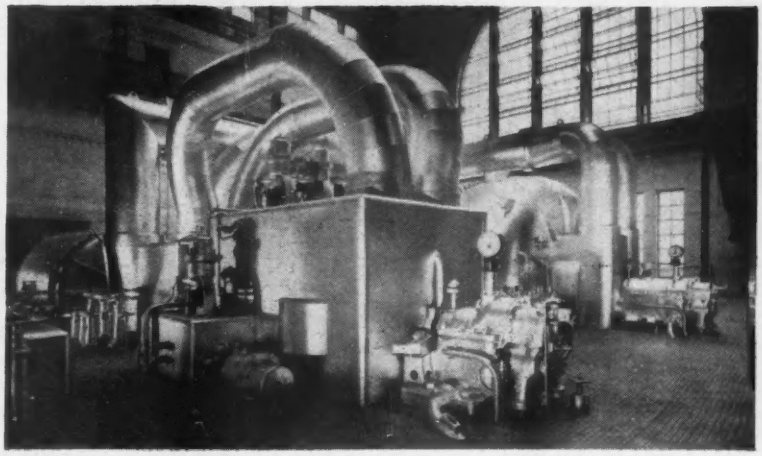
Nevertheless, the C.P.R.E. noted with pleasure that the general standard of design, "even in concrete columns," has shown an improvement, and that attention was being paid to co-ordinating designs of columns and lanterns to produce harmony. The Council also queried the regulation 25 ft as the standard Group A mounting height, adding that it was arguable whether the highest lighting efficiency was attained. Now that more money is being spent on street lighting, the C.P.R.E. urges that local authorities should seek advice on the day-time appearance of new installations as well as on the technical aspects and night-time efficiency.

As regards the routing of distribution lines, there appears to be some resignation to the inevitable in this year's report. The supply industry is doing its best, the Council concedes, but is handicapped at the outset by the rigid policy of economy. C.P.R.E. maintains that in the case of low tension lines, the extra cost of underground transmission, where it is desirable in the interests of the preservation of natural beauty, could and should be met from the resources of the industry with, if necessary, Government help. It admits to fighting a losing battle while economy dictates a policy, which invariably rules out the possibility of underground distribution. "Better things had been expected from a nationalised industry," the report adds. Referring to the planning of grid lines, the Council expresses concern at the seemingly impossible task of obtaining the plan of a line throughout its length.

The prospect of more and more television transmitters is described as disquieting. Here again, however, C.P.R.E. appears to accept, although with displeasure, the increase in television stations.

Plant Performance at Portobello during 1953

Some details of the performance during 1953 of the No 1 turbo-alternator set made by Richardsons Westgarth Ltd., and installed at Edinburgh's Portobello power station were received in this office last week. The set was designed for a steam pressure of 1,350 lb/sq. in. g. with temperature of 950°F. Of this, auxiliary plant consumed 30 million units, so that about 451 million units were supplied from the station. This represented about 92% of production which would have been available if the generator had been kept at a load of 60,000 kW throughout the year. To generate that amount of power the machine with its boiler consumed 207,307 tons of coal and 220 tons of fuel oil. Efficiency for the whole year worked out at 30·86%, and the best single month was November when an efficiency of 32·02% was achieved after allowing for auxiliary power



BEA's BORROWING LIMIT TO BE RAISED TO £1,400 m.

BORROWING limits of the B.E.A. are to be raised to £1,400 millions. A Bill providing for this increase, The Gas and Electricity (Borrowing Powers) Bill, was introduced and read a first time in the House of Commons last Thursday. As the title implies, the measure concerns the borrowings of the Gas Council as well. Under the Electricity Act 1947 the aggregate amount which could be borrowed was limited to a maximum of £700 millions. The B.E.A. has at present been given authority for borrowings of £635 millions up to the end of this month, and it was expected that the statutory limits will have been reached by the end of 1954. Both undertakings requested the extension and submitted comprehensive programmes of probable development up to 1960 in support of their request. The Minister has approved the general lines of development subject to periodic review.

Official Delegates to World Power Conference

AS IS generally known the sectional meeting of the World Power Conference to be held in Brazil will open on 25 July. It was stated last week, however, that Lord Citrine, chairman of B.E.A., has been appointed by H.M. Government to represent them as Official Delegate there. Sir John Hacking, vice-chairman of the British National Committee of the Conference, will be representing the committee as Official Delegate. The latest list of U.K. and other British participants contains the names of 29 other persons and is truly representative of the numerous branches of the electrical industry in this country. The Sectional Meeting closes on 10 Aug. Annual report of the Conference for 1953 has just been published and contains an up-to-date review of arrangements for future meetings, already announced from time to time in these columns. The report is available from the British Committee, 201-2 Grand Buildings, Trafalgar Sq, W.C.2, price 1s. 6d.

OFFICIAL PUBLICATIONS

BRITISH STANDARDS. B.S. 2478: 1954: Tapes and spools for commercial and domestic magnetic tape sound-recording systems; B.S. 2475: 1954: Performance of octane band-pass filters.

HUMAN RELATIONS IN INDUSTRY. First report of D.S.I.R. and Medical Research Council (see this page). H.M.S.O. 1s.

GAS AND ELECTRICITY (BORROWING POWERS) BILL. Presented to House of Commons last week (see page 877). H.M.S.O. 3d.

Electronics Exhibition opens Next Month

NINTH annual Exhibition of Electronics to be organised by the N.W. branch of the Institution of Electronics will be opened by Dr B. V. Bowden, at the College of Technology, Manchester, on 14 July. The exhibition will remain open until 20 July. It will comprise two sections devoted to Scientific and Industrial Research and to Commerce, and over 50 exhibitors are taking part. An extensive programme of lectures has been drawn up, dealing with most aspects of the subjects, and film shows have also been arranged. Another feature will be the visit to the computing department of Manchester University. Application for tickets should be made to the organising secretary, Mr. W. Birtwhistle, 78 Shaw Rd, Thornham, Rochdale.

COURSE ON TRANSISTORS

DEPARTMENT of Electrical Engineering at Bradford Technical College have announced a course of eight lectures on the Principles and Applications of Transistors which is to open on 29 Sept. Lecturer will be Mr G. N. Patchett, and his talks will be given on each succeeding Wednesday at 7 p.m. Fee for the course is £1. 10s. and application should be made to the Principal of the College. A number of practical classes in this subject are to be held after Christmas.

Brighton planning to scrap Trolleybuses

REPLACEMENT of Brighton's trolleybuses by motor buses is recommended in the Corporation's Transport Committee's report which will be before the Council at its next meeting towards the end of this month. A sub-committee was appointed at the end of 1950 to consider a revision of the Agreement between the local Bus Co. and the Corporation. It was found that the existing mode of operation precluded the Corporation running their services as cheaply as the company, and that that situation could not be remedied so long as the Corporation continued to use trolleybuses.

The explanation of this was that the company and Corporation operated services in the approximate ratio of 3 to 1, but not only was the Corporation's services the smaller, but they had two types of vehicles. On the trolley routes the receipts per mile were higher than many others, but total receipts of the undertakings were pooled, 72½% going to the company and 27½% to the Corporation. The same system of sharing did not, however, apply to costs involved, and the Committee's report is quite definite in asserting that the routes operated by trolleybuses were the most expensive although this was not a criticism of the vehicles themselves, but of the routes. The report goes on to state that even if it was accepted that the trolleybus, as a vehicle, was in some respects the equal or superior of the motor bus, it could not, because of its restricted field of operation be efficiently operated in any complete intergration of services throughout the area. It was essential that both undertakings used the same type of vehicle, namely the motor bus. It was also pointed out that most of the Corporation's vehicles were now reaching the end of their useful life. The Corporation now has 52 trolleybuses running over 15 miles of route, mostly hills.

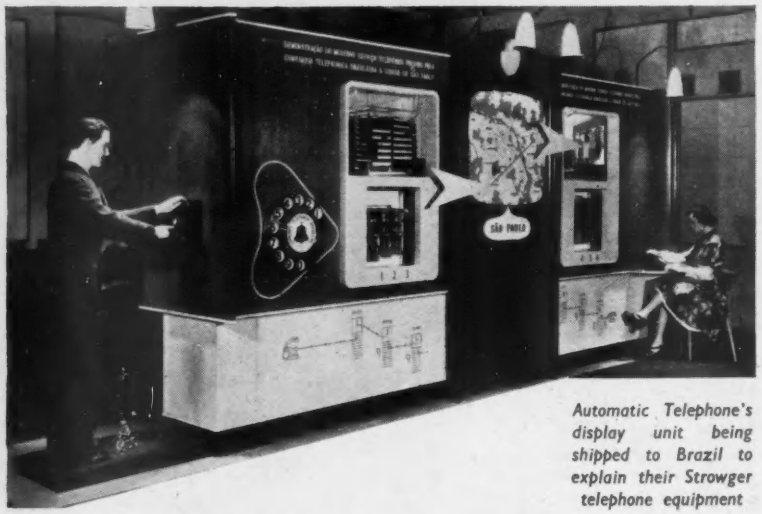
Research into Welfare of Factory Employees

THE first report of a committee set up last year by D.S.I.R. and the Medical Research Council to advise on research into human relations in industry, was published last week. Included in the report are research projects which have been approved and which are now going ahead. The main task of the committee so far has been the formulation of a research programme. Seventy-eight projects were considered and 12 have already been approved. One, on the effect of incentive payment schemes is being carried out by Birmingham University. Work in progress at Edinburgh University is directed to finding out how friction between inspection and production departments can be avoided. Another project at Edinburgh is on the adjustment to technological change, and this is being done with the co-operation of Scottish firms which have recently begun to develop electronic equipment. Liverpool University is studying the way in which new production methods and techniques can be absorbed without raising human problems.

Special Display Unit to explain Sao Paulo's Strowger Telephones

ON ITS way to Brazil at the present time is an ingenious display unit explaining the operation of the Strowger Automatic Telephone equipment installed not so long ago as part of the modernisation and extension of Sao Paulo's telephone network. The display has been designed and made at the Liverpool works of Automatic Telephone and Electric Co., Ltd., for the Companhia Telefonica Brazileira and will be exhibited in Sao Paulo as part of the city's fourth Centenary Celebrations. The unit is 20 ft long and comprises a map of the telephone exchange network, flanked by small-scale models representing two exchanges located at opposite ends of the city. Below the model exchanges are selector mechanisms operating in response to digits dialled by a dummy gentleman subscriber. The progress of the call to the dummy lady is plotted by an illuminated line. On arrival at its destination, the telephone rings and the dummies "speak."

Up to 1945, Sao Paulo used the older type Strowger equipment, but the modern speedier type of equipment was ordered to cater for the increasing size of the system. To complete the current phase of the modernising programme, Automatic Telephones are to supply automatic equipment to cater for 26,000 subscribers between now and next June. In addition the company is making a large extension to the Sao Paulo trunk exchange consisting of 140 operator positions, with associated switching and interworking equipment.



Automatic Telephone's display unit being shipped to Brazil to explain their Strowger telephone equipment

Our accompanying photograph was taken inside the British Thomson-Houston works at Willesden where some of the seventy 132 kV 3,500 MVA shunt arc oil circuit-breakers on order at present are being made. In the background can be seen 275 kV 750 MVA lenticular oil circuit-breakers for the British Super-Grid

Speedy Application of Research to Industry

NOT very long ago there were frequent references to the transmission and application of the results of research to industry. In fact, for some years now it has been the general belief that while British research work was probably the most advanced its implementation was far too slow. It is, therefore, welcome news that a joint Science and Industry Committee has been established to investigate the possibility of speeding up the application to industry of the results of scientific research. The committee has been set up by the Royal Society of Arts, the British Assoc. for the Advancement of Science, and the Nuffield Foundation.

This new joint committee follows the preliminary investigation carried out previously by the British Assoc. for the Advancement of Science. Its terms of reference are comprehensive. Chairman is Prof C. F. Carter, and other members include Dame Caroline Haslett and Dr T. E. Allibone.

Residents protest against £27 Wiring Bill

THERE is trouble in Finnieston St, Greenock, over the charges made for installing electricity. A petition signed by nearly 30 residents has been sent to the Corporation protesting against the addition of £10 or £11 on the original estimate for wiring the houses. It appears that a letter sent to householders in 1951 stated that as a result of an informal estimate obtained, the cost of an electricity supply would be about £18 for a three-apartment house with corresponding amounts for two-and four-apartment dwellings. It is claimed that an estimate submitted a year ago gave much the same amount. Official reason for the increase is that costs have risen since the first estimate was obtained.

Many householders in the area have had an installation privately but the highest cost was £24, or nearly £4 cheaper than the Corporation's price. Estimates were obtained from a number of firms, the Corporation maintains, and the lowest, which was £1,802. 16s. 4d. was accepted. Work was started in 1952 but was not carried out by the firm which submitted the first estimate. Finnieston St is convinced, however, that £27 for an installation in a three-apartment house is much too high, and want that figure lowered.

Fair Trading Amendments

A NEW schedule replacing the existing schedule 5 in Edition 5 of the Fair Trading Policy of March, 1953, has been issued by the Electrical Fair Trading Council. It deals with domestic electric heating, cooking and other appliances. Some of the items listed in the original schedule have been excluded, and the Associated Manufacturers of Domestic Electrical Appliances, responsible for the schedule, have reduced the discounts available to commercial and industrial buyers defined as "Special Large Buyers" and "Recognised Users." The new schedule 5 will soon be available in printed form for insertion in the existing Policy and may be obtained from the Council's secretary free of charge.

ENGINEERS' CONFERENCE

THE Commonwealth Engineering Conference, held this year in London, closed last Friday. In the course of its ten business sessions, the Conference discussed numerous matters of interest to its Constituent Institutions, ranging from the proper conservation of natural resources to more detailed questions. The latter included the education and training of professional engineers, the help which the engineering profession could give to the provision of an adequate number of technicians, and measures to secure the most effective interchanges of lecturers and speakers on engineering subjects.

Recommendations to the Councils of the three Institutions concerned, the Institution of Civil Engineers, the Institution of Mechanical Engineers and the I.E.E., were drawn up. When approved they will be published in the Journals.

The next meeting of the Conference will take place in Australia in 1958.

N.W's Consumers are Correctly Assessed

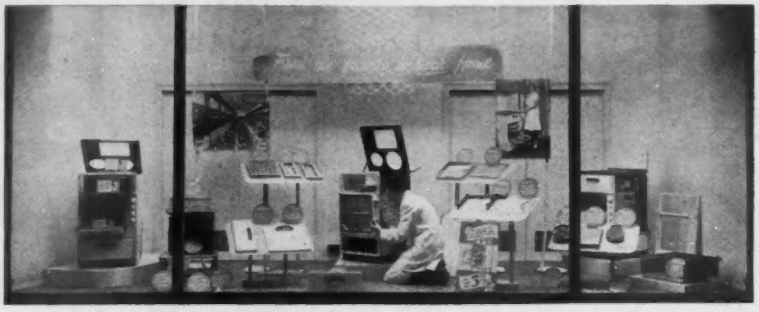
IT WILL be recalled that in our 13 May issue we reported the N. Western Consultative Council's assertion that 50% of consumers in the Area had been wrongly assessed for electricity charges. Inquiries by the Board since, however, have produced no evidence to support this view, Mr A. O. Johnson, chief commercial officer, told the Council at their latest meeting. He opposed a suggestion that a comprehensive check on domestic assessments should be undertaken. A "blitz" would expose them to charges of bureaucracy, dictation and red tape, he said, besides entailing taking on extra staff. Mr Johnson said the best solution appeared to be to detail two or three officials in each sub-area to look out for errors, and rectify them. The Council decided not to press their request to hasten the checking of assessments pending a meeting between their leaders and Mr Johnson. This matter arose following reports that many consumers had confused the status of sculleries and kitchens.

Atlantic Cable Order

IT WAS announced by W. T. Henley's Telegraph Works Co., Ltd., at their annual meeting that they have recently obtained the contract for the cable required for the land link in the trans-atlantic telephone scheme financed jointly by British, Canadian and American Post Office Authorities. Henley's will supply the land line across Newfoundland linking the submarine cable between Great Britain and Newfoundland, and Newfoundland and Nova Scotia.

The First Half-Century

Sir,—As your readers are probably aware, a most important conference was held this morning at St. Pancras Town Hall, to consider and decide on steps to be taken to relieve electricity undertakings from the onerous effects of an action for injunction for nuisance. In the end a committee was appointed to report at the conference's next meeting. The moment a power station is put up, every neighbour begins to look around for the "flood" which is to lead him to fortune. Consider his position. In one case the judge laid down this principle of law. "It is not," he said, "a question of how much noise there is. The defendants admit that the working of the machinery is audible; therefore the plaintiff is entitled to an injunction." In this state of the law it is obvious that any person who may have obtained an injunction has the "undertaker" at his feet. It is not a question of equitable compensation: the defendant must either shut down, or buy the plaintiff out at his own price. Everyone in the supply industry will bless the committee and pray for their success. The pressing question is: what will they aim at?—*From our issue of 9 June, 1904.*



LIVE COOKER DISPLAY

A member of the staff of the N.E. Electricity Board built a cooker from the basic parts assembled in a recent window display at the Board's headquarters in Carliol St., Newcastle. The various components of a British National Electrics cooker were also on show with explanatory showcards, and the ease of assembly and dissembly, particularly from the aspect of cleaning, was suitably demonstrated periodically during the day. This live display attracted a great deal of attention especially whilst the cooker was being built

Private Power at Bath and West Show

IN VIEW of allegedly inaccurate and misleading reports (not in the ELECTRICAL TIMES) concerning the electricity supplies at the Bath and West Agricultural Show, taking place this year at Exeter, the S. Western Electricity Board has issued a statement. They point out that the Board was not asked to quote terms in respect of supplies at Exeter. Had they been asked, it is calculated that the price quoted would have been considerably less than a quarter of the figure of £4,000 mentioned in some Press reports. In addition the Board points out that, with a duty to safeguard consumers, they could not properly be expected to compete with the provision free of charge of generating plant and equipment reported to be worth about £50,000.

Aluminium Scholarship

THE Institution of Structural Engineers has accepted an offer by the Aluminium Development Association of a research scholarship to the value of £400 p.a. to enable the holder to undertake research on some aspect of the application of aluminium alloys to structures. The scholarship will be awarded in alternate years for a two year period. The first award is to be made this year and entries close on 15 July.

Sayings OF THE WEEK

"Gas and electricity meters are not banks to which to go when people are hard up." . . . ALD. H. FAIRBOTHAM in Hull Magistrates Court.

"It is vitally necessary that this basic truth—that the best paid industries are those with the best record for increased productivity—should be brought home to all of us and particularly to the rank and file in industry." . . . A. J. CHANTER, Director of Industrial Relations, Personnel Administration Board in the *Financial Times*.

"The mining industry has been bedevilled with statistics and yet management has been lamentably short of effective means of ensuring efficiency. Records should be designed to expose simply the facts of primary interest." . . . MR E. H. BROWNE, director-general of production, N.C.B., speaking at Buxton last Friday.

Bonus for the Workers

WELCOME Whitsun present for employees of Horace Green and Co., Ltd., the Keighley manufacturers of electric motors, was the chairman's declaration of a dividend of 14% on wages paid. The company's 40th annual profit sharing meeting took place towards the end of last month and was addressed by Mr Horace Green (chairman), Mr G. S. Green and Mr G. W. Green.

Overseas Scholarships Scheme extended

AN increase in the number of scholarships to be awarded under the F.B.I. Overseas Scholarships scheme is announced in a booklet published by the Federation last week. The booklet has the lengthy title of "F.B.I. Overseas Scholarships—Training Overseas Engineers as an Aid to Future Exports," and describes recent progress for bringing to Britain young graduate engineers from the less developed countries for practical training. The scheme began on a modest scale in 1950. Nine of the 44 students who have been training here have now completed their courses. Eight more are expected shortly. But in the next year or two it is hoped to award some 120 scholarships each year.

Wanted: £50,000 a Year

BOARD of Management of the Royal Commercial Travellers' Schools has announced that Mr Basil N. Reckitt, chairman of Reckitt and Colman Ltd., has agreed to act as President of the Maintenance Appeal for 1954. The main task confronting the new president is that of raising over £50,000 a year, which is the sum needed to maintain, clothe and educate the boys and girls at the Schools. In addition, funds are also needed towards the cost of a vital rebuilding programme which has already absorbed a large proportion of the invested funds. Contributions towards the funds will, of course, be more than welcome, but offers to act as Stewards for the Appeal would also be gratefully acknowledged by the Secretary, Mr. A. H. Carpenter, 48, Broadway, S.W.1.

NEWS IN BRIEF

To meet exhibitors' wishes the 1954 National Poultry Show at Olympia will be held between 8 and 10 Dec. instead of 9 and 11 Dec.

Line Equipment Ltd. announce they have received an order from the New Zealand Hydro-Electric Dept. for two 220 kV and fourteen 110 kV 600 A vertical break rotating isolating switches destined for Otahuhu substation.

There was a total of 4,000 visitors at the Open Day of the Loughborough works of Brush Electrical Engineering Co., Ltd., which took place on 29 May.

Annual dinner of the Cromptonian Association was held at the Trocadero, London, on 28 May. 230 members and about 30 guests were present.

From 29 May to 6 June, overseas distributors and sales agents attended a conference at Harrogate organised by Steel's Engineering Products Ltd.

Contract for building work at the new medium-power television transmitting station at Meldrum, Aberdeenshire, has been placed by the B.B.C.

British Insulated Callender's Construction Company announces receipt from the Iraq Development Board of a £69,000 order for six Callender-Hamilton bridges.

Thermodore (Great Britain) have entered the Pakistan market. *En route* to that country at present is a £1,000 order comprising 70 storage heaters for the Government's new Ordnance Factory.

Rt Hon Sir David Eccles, Minister of Works, will open Sheffield's Building Exhibition at the College of Commerce and Technology on 21 June. The exhibition closes on 26 June.

Electrical industry in Lancashire, Cheshire and Derbyshire has vacancies for nearly 600, Ministry of Labour returns show. Unemployment in the area totals nearly 300.

Contract for building work at the new medium-power television transmitting station at Divis, near Belfast, has been placed by the B.B.C. Work is expected to start in August.

Third in the series of courses on Work Simplification at Roffey Park Institute, Horsham, took place recently. A further course will be held in the five days from 27 Sept.

QUESTIONS IN PARLIAMENT

Coal Price Structure

A REPETITION of his request that the Coal Board should give full information of the basis of their price structure when asked by industrial and domestic consumers' councils, was made by Mr P. Roberts. The Minister of Fuel said he was sure that the Board would make such information available.

Electricity Charges

THE Minister of Fuel and Power said he was not at present in a position to make a statement concerning the possibility of revising electricity charges so that they were based on the amount of power consumed rather than on the area of the premises. Miss A. M. Bacon, who asked the question, also drew the Minister's attention to the dissatisfaction caused in Yorkshire, particularly among small traders, following the announcement of new charges. He replied that the new scheme of charges was made under a general scheme which was approved by his predecessor. As to its application, he had consulted with the Boards and asked them to consider carefully the way in which it affected consumers, with a view to considering whether changes ought to be made later.

Trade with the East

ALTHOUGH declining to amplify previous statements on East-West trade Mr D. Heathcoat Amory answered questions on the export of diesel generators to Russia. Mr W. L. Wyatt asked why the Board of Trade refused to allow the export of diesel generators of 750 kW or more. Mr Amory asserted that this was not prohibited but it had to be kept within limits for security reasons. Mr Wyatt asked what was meant by "not prohibited" because application to export such plant had been refused. The Minister of State reiterated his statement that all applications had not been rejected. In fact 16 generators of this capacity had been exported in the past year. Cases were taken on their merits but the reason why some applications were rejected was because a system of quantity control was exercised.

East-West Trade

FURTHER questions were asked last week concerning trade between Russia and the West. Mr G. H. Bing asked if the embargo list II determined by the Consultative Group Co-ordinating Committee could be published. Mr D. Heathcoat Amory said that the international control lists were agreed between the countries operating the controls and so far it had not been the practice to publicise the lists. Replying to a later question Mr Amory explained that the Committee was a consultative body of experts and it would not be appropriate to publish its report on the relaxation of restrictions on East-West trade. He added, however, that the President of the Board of Trade would be making a statement on the subject of the current review of conditions as soon as he was in a position to do so.

Factory Inspectors

RECRUITMENT of factory inspectors was the subject of a question by Mr J. Silverman who asked whether persons with substantial industrial experience were being taken. He was told that candidates with considerable works or other practical experience were eligible to compete in the competitions for inspectors. A competition was taking place at present. He then asked whether any persons in a factory, apart from those legally responsible, were informed of an inspector's warning. The reply was "none."

Pollution at Dunston

NOT for the first time it was asked in the House last week whether anything was being done about the emission of dust and smoke from Dunston power station. Mr A. E. Marples reaffirmed that the Minister was making inquiries.

Queries on Nationalised Industries

ANOTHER periodic question which is asked concerns the possibility of altering existing practice to enable Members to query the administration of nationalised industries. Sir W. Smithers raised the matter again last week and was told by the Prime Minister that there appeared to be no reason to depart from the practice whereby Ministers were not expected to concern themselves with the day-to-day administration of undertakings.

ELECTRIC SUPPLY NEWS

Cumberland

The County Council has approved proposals by the North-Western Electricity Board for an overhead 11 kV line to High Crindledyke, Kingmoor, reinforcement of the existing high voltage supply to Broughton Moor and 11 kV and low voltage line to Ainstable Village.

Felling-on-Tyne

The Ministry of Housing and Local Government has approved the Urban Council's recommendations for the resiting of the Dunston-Carville 66 kV electricity feeders where they cross the Leam Lane housing estate, Felling.

Inverness

Hoping to merge their 70 accounts into one thereby reducing costs, the Inverness Town Council Finance Committee is still considering the refusal of the North of Scotland Hydro-Electric Board to enter into a special contract with the council for the supply of electricity at a concession rate. (We referred to this matter on 15 Apr.) In rejecting the proposal, the Board has stated that the appropriate scales applied to each establishment owned or occupied by the council, and in determining prices the board could not show undue preference or exercise undue discrimination.

Yorkshire

The new standard tariff for industrial supplies to be introduced on 1 Oct. by the Yorkshire Electricity Board, regarding which there has been strong comments locally, as we have reported, is divided into two sections with a block tariff for the smaller consumer and a two-part tariff for larger concerns. The former has a unit charge of 4¼d. for each of the first 50 units p.q. per kVA of assessed demand, the unit charge being lowered in three steps to ¾d. for all units over 1,500 p.q. per kVA demand. The two-part tariff for demands between 5 kVA and 50 kVA has a fixed charge according to the demand plus a unit rate varying from 0·675d. to 0·575d. for h.t. supplies and 0·725d. to 0·625d. for l.v. supplies.

Wisbech

The Eastern Electricity Board are seeking to recover from Wisbech Council the sum of £1,600 which the Council has underpaid in respect of electricity consumed at Lynn Rd pumping station, it is stated. The reason for the underpayment, apparently, is that the Board's meters at the station have been misread since they were installed in September 1949. Because of this, wrong accounts have been rendered over the years. Now, the Board are sending correct accounts, which will mean that the Council will have to pay £450-£500 each year more than they had estimated, because the estimates for the year were based on the previous year's cost. The Town Clerk has been authorised to seek counsel's opinion.

Lighting Schemes

Blackpool. Loan sanction has been received for a £35,500 scheme for the installation of fluorescent lighting along the promenade from the Gynn to the Pleasure Beach, involving 146 double-armed standards, and 136 double-arm brackets on existing tram standards.

Willesden. The Council has received consent of M.o.T. to install sodium lighting on the North Circular Rd between Staples Corner and the boundary with Ealing.

COMPANY ACTIVITIES

WITH commendable promptitude, Vactric Ltd. has produced its results for the year to March last, in June instead of October. A few weeks ago when the company paid up all its preference arrears I suggested that the Ordinary shareholders, after a lapse of 8 years, were at last in sight of a dividend again. But I was hardly prepared for an immediate payment. But it is now announced and it amounts to 10%. The preliminary figures show a group profit of £364,218 which contrasted a loss of £32,615 for the previous year. After all charges, including taxation of £186,253, against a credit brought back of £18,533 for the previous year, the net profit is £145,803 against a net loss of £23,586. This is a remarkable recovery and reflects credit on all concerned.

Under the management of Sir Philip Warter, Enfield Cables is getting rid of what may be regarded as extraneous activities. It has already been announced that the Brynmawr factory which has cost the company in one way or another over £2 millions, is to be sold to Dunlops for £750,000. And now Sir Philip announces the 100 kW wind generator developed for the B.E.A. is to be passed on to someone else. This project has been developed at substantially higher costs that at first expected, and is now completed.

The machine is not to be manufactured by the company "It will be our aim," says the chairman, "when the first machine is worked properly to find another enterprise willing to carry on and develop what we have started."

From the shareholders point of view it is of interest to learn that in the absence of unforeseen circumstances the accounts for 1954 and subsequent years will no longer have to bear any further liabilities in respect of this project.

Sir Philip also announces that with the disposal of these two interests, the reorganisation of the true business as cable makers will be made possible. Wisely, he does not hold out hopes of favourable results in 1954, but is convinced that the eventual outcome of the board's efforts, backed by a strong liquid position, should enable the company to compete effectively in overseas markets. At present, the rubber and plastic departments of the cable works are busy, but the other departments need work. No dividend is paid for the past year. But for the two special projects, trading profit for last year would have exceeded £400,000. Instead, it was cut down to £101,000—*From our City Correspondent.*

Ada (Halifax) Ltd.

There is to be a 15% dividend for the year to 31 Mar. last for this machine tool and washing machine manufacturing firm. That figure is equivalent to the 13¾% paid for the previous 11 months' period. Trading profit for the year is £184,406 compared with £83,159 for the previous eleven months.

Aiton and Co. Ltd.

Arrangements are being made to market the 500,000 10s. Ordinary shares of this concern of pipework manufacturers and engineers. 150,000 were placed last week at 25s. each.

Engineering and Lighting Equipment Ltd.

The final dividend is raised by 5% to 20% (plus a 10% bonus) making a total of 30% (*15%*) for the year. After charging increased taxation, the net profit for the year ended 31 Mar. last is £84,912, as against £41,285 a year ago.

Garrard Engineering and Manfg. Co. Ltd.

There is a final dividend of 15%, making 25% for the year ended 31 Jan. last, on the increased capital, compared with a total of 21% for the previous year. The net profit for the year at £165,854 is more than double that of a year ago.

Mather and Platt Ltd.

The directors propose to issue 1,363,660 Ordinary £1 shares in a two-for-three scrip issue.

Siemens Brothers and Co. Ltd.

Explaining the serious setback suffered by the company during 1953, General Sir William Morgan, chairman, points out that apart from the slackening of orders, chiefly from Government Departments at home and abroad, there was severe competition with manufacturers seeking orders in overseas markets and an appreciable proportion of the orders so obtained provided but small profit and in some cases no profit at all. There was also a continued shortage of orders, mainly from nationalised industries, for power cables and accessories, and a serious increase in manufacturing and distribution costs due to wage and salary awards. The principal home subsidiary, Siemens Electric Lamps and Supplies Ltd., was also affected by those difficulties. Overseas, the Canadian company had a particularly difficult year, Sir William states, while in Australia, South Africa and India results were affected in varying degrees by national capital expenditure limitations, import restrictions and the increasing growth of local manufacture. Regarding the company's shareholding in Siemens and Halske A.G., he has no news of a settlement.

Year to Dec. 31	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	915,077	465,581	21	7½	36/4	29/3
1950	1,364,603	500,842	35	10	32/–	30/1
1951	1,590,764	546,422	39	10	52/–	31/3
1952	1,904,505	556,425	24	10	43/6	28/–
1953	1,262,323	488,353	20	10	37/–	31/6

J. Stone and Co. (Holdings) Ltd.

The total distribution for 1953 is raised to 20% with a final dividend of 15%. Last year the total was 18%. The group profit for the year is £1,416,585, which is over £136,000 more than for 1952. The net profit amounts to £548,115 (*£495,108*).

John Thompson Ltd.

With a final dividend of 12½%, the total is again 22½% for 1953, the group trading profit for the year is £1,472,760 against £1,343,729 a year ago. Treasury consent has been obtained for the issue of 1,146,599 Ordinary 5s. shares at 15s. each, to be offered to holders on a one-for-three basis.

Vactric Ltd.

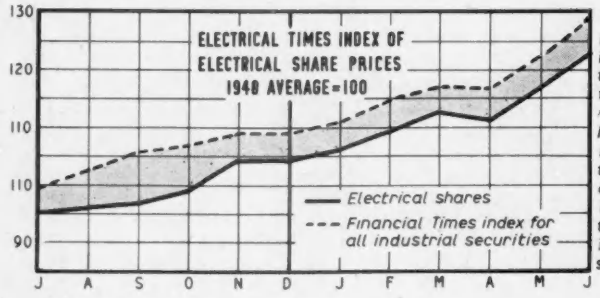
For the first time since 1945 there is to be a dividend on the Ordinary shares for the year ended 27 Mar. last—this time of 10%. The group profit for the year is £364,218 compared with a loss of £32,615 for the previous year. The net profit amounts to £145,803 according to the preliminary statement.

Vent-Axia Ltd.

The group profit for the year to 31 Mar. last is £115,317 (*£85,723*) which includes profit for eight months of a subsidiary acquired. The final dividend is raised to 40% (*37½%*) making a total of 70% (*62½%*) for the year.

Dividend Declared

R. A. Lister and Co. Interim of 2½% (*same*).



The substantial rise in share prices during April was maintained at almost the same rate last month. The Financial Times index for all industrial shares soared during May from 123 to 128·6, whilst the Electrical Times index for electrical shares rose by 5·1 to 122·2

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

11 June—Barking T.C. Mercury vapour lamps on concrete columns on B1367 route.—Advertised in 3 June issue.

12 June—Ashford (Kent) U.D.C. Street lighting equipment and installation.—See 27 May issue.

12 June—Glasgow. Cables, lamps, and welding electrodes during year from 1 July for Clyde Navigation Trust.—See 3 June issue.

12 June—Hucknall (Notts) U.D.C. Rewiring at public library.—See 27 May issue.

12 June—West Hartlepool T.C. Street lighting equipment.—See 27 May issue.

14 June—Ayrshire. Supply of lamps.—See 3 June issue.

14 June—Sale T.C. Stage lighting and wiring at town hall.—See 27 May issue.

14 June—Bentley-with-Arksey U.D.C. Installation in 50 houses in Rosedale Rd and Queen's Drive.—See 3 June issue.

14 June—Sittingbourne and Milton U.D.C. Erection and installation of street lighting at various points.—Advertised in 27 May issue.

14 June—Wallasey T.C. Installation at technical school, Mosslands Drive.—Advertised in 3 June issue.

14 June—West Riding. Rewiring of Heckmondwike school, Rothwell Micklethown school, and Rothwell Stourton school.—See 27 May issue.

14 June—Woodbridge (Suff.) U.D.C. Motor pump with fully automatic starter and fittings, etc.—See 27 May issue.

15 June—N. Cotswold R.D.C. Wiring and supply of fittings of 15 houses at Ebrington and Clapton-on-the-Hill.—See 27 May issue.

16 June—Leeds. Rewiring in training school at the Regional Hospital Board's headquarters.—See 3 June issue.

16 June—Manchester T.C. Two centrifugal pumps and other gear at Haweswater.—See 20 May issue.

16 June—Manchester T.C. Installations in 397 houses on Langley estate.—Advertised in 27 May issue.

16 June—Wandsworth B.C. Supply of armoured cable. Borough Engineer, Municipal Buildings, S.W.18.—Advertised in this issue.

17 June—Belfast T.C. Rewiring of lighting installation at Malone primary school, Balmoral Ave. Education Architect, 40 Academy St, Belfast.

17 June—Belfast. Installation in school in Whiterock Rd.—See 27 May issue.

18 June—Londonderry. Rewiring etc. at St. Eugene's Cathedral.—See 3 June issue.

18 June—Londonderry. Electrical Installation at Magherafelt intermediate school; same at Millbrian primary school; and heating installation at Millburn school. Education Office, Whitehall Chambers, New Row, Coleraine. Deposit £1 each contract.

19 June—Lincolnshire. Maintenance of refrigerators, mixing and other machines. J. E. Blow, clerk to C.C., County Offices, Sleaford.

19 June—Newcastle-on-Tyne T.C. Sodium and fluorescent lighting equipment for Transport and Electricity Undertaking's Slatyford depot. General Manager, Head Office, Manors, Newcastle.

19 June—Prestwich T.C. Improved street lighting in Hilton Lane.—See 3 June issue.

19 June—Swansea T.C. Installation in 40 flats at Gandros.—Advertised in 3 June issue.

19 June—Swinton and Pendlebury T.C. Wiring and supply of fittings to 80 dwellings on Clifton estate.—Advertised in 27 May issue.

21 June—Ossett T.C. Street lighting in Bank and Dale Sts, and Market Place.—See 27 May issue.

21 June—Southall T.C. Sodium lamps, capacitors and transformers; concrete columns with installation of equipment.—Advertised in 27 May issue.

21 June—West Riding. Rewiring of Ossett grammar school and Stocksbridge senior and J. M. and I. school.—Advertised in 3 June issue.

22 June—Keswick (Cumb) U.D.C. Supply and installation in Main St, of fluorescent lighting units.—Advertised in 27 May issue.

23 June—Sidmouth U.D.C. Fluorescent and tungsten filament group B street lighting.—Advertised in 3 June issue.

24 June—Belfast T.C. Private automatic telephone system at Power Station West.—Advertised in 20 May issue.

28 June—Ramsbottom U.D.C. Supply, erection and fitting of 61 concrete columns and other necessary equipment for installation of 140 W sodium lighting on trunk road A.56. Engineer and Surveyor, Council Offices.

3 July—Aberdare U.D.C. Street lighting equipment to replace existing equipment.—Advertised in 3 June issue.

3 July—Mountain Ash (Glam) U.D.C. 9½ miles group A street lighting on main roads.—See 3 June issue.

5 July—Manchester T.C. Electrical installation in residential nursery, Longley Lane, Wythenshawe. City Architect. Town Hall, Deposit £1. 1s.—Advertised in this issue.

20 July—Epping U.D.C. Installation of electricity in about 20 houses. Council's Surveyor, 91 High St.—Advertised in this issue.

30 July—Taunton T.C. Supply, installation, etc., of sewage and storm water pumping plant with electric motor and diesel engine drive, and comprising seven vertical spindle pumps, six electric motors, one diesel engine, control gear, wiring, etc. Engineer, A. H. S. Waters, 25 Temple Row, Birmingham. Deposit £3. 3s.

No date stated—Stonehaven T.C. Installation in eight blocks houses and shops in Ardubine Rd.—See 3 June issue.

No date stated—Co. Tyrone. Installation at Hutton school, Beragh.—See 27 May issue.

No date stated—Oswaldtwistle U.D.C. Installation of 51 columns and brackets for public lighting.—Advertised in 3 June issue.

No date stated—Dereham (Norf.) Wiring of eight houses in Bradenham Rd, Shipdham. Clerk of R.D.C., Guildhall, Dereham.

. . . and Overseas

Details of items marked • may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.

21 June—Pakistan. Supply to Mechanical Engineer at berth No. 2, Keamari, of 4 electrically driven centre lathes, for Karachi Port Trust. Rendel, Palmer and Tritton, 125 Victoria St, London, S.W.1. Fee 5s.

28 June—India. Supply of 8-10 ton flameproof electric mooring capstans for Bombay Port Trust, Marine Oil Terminal. Documents from Sir Bruce White, Wolfe Barry and Partners, 1 Lygon Pl, Grosvenor Gdns, London, S.W.1, for 10s. fee.

30 June—Portuguese E. Africa. Supply of electrical parts including fuses, condensers, 6V batteries, contacts, insulating materials, insulated cable, resistances, commutators, electric lamps, etc., for

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 98 queries answered this week

"Ace Roto Washer" washing machines, address for? C.W.S.—W. and S. Summerscales Ltd., Parkside Works, Keighley, Yorks.

"Colley-Bates" battery filler caps, makers of? R.O.F.—Colley-Bates Co., 126 Seymour Place, W.1.

Mechanical time switches, sp. 50 V, d.c. 5 amps—30 min working, makers of? B.B.L.—Venner Ltd., Kingston By-Pass, New Malden, Surrey.

"Morway" 12 V car kettle, makers of? R.W.H.—Conway Heater Co., 34 Conway Ave, Birmingham 32.

Tuscan Engineering Co., Ltd., address of? Y.E.B.—Trading Estate, Bridgend, Glamorgan.

"Stanley" drills, address for? E.S.—E. P. Barrus Ltd., 12 Brunel Rd, W.3.

"Exalt" switches, address for? I.E.—Edison Swan Electric Co., Ltd., 155 Charing Cross Rd, W.C.2.

"A. C. and E." fans, makers of? C.G.—Air Conditioning and Eng. (N.I.) Ltd., Aircon Works, Laurel Vale, Tandragee, Co. Armagh.

ANSWER WANTED

Electrolytic condenser 340-400 mfds 150 V on R.M.S. surge, maximum dimensions 2 in. dia. x 3½ in. long, makers of? H.M.L.

Ports, Railways and Transport Dept., Lourenco Marques. B.o.T. (Ref.: ESB 13986/54).*

1 July—Egypt. Cairo Electricity and Gas Admin. require supply of 50 kilometres underground h.t. cables, 11 kV, paper insulated and oil impregnated, lead sheathed and double tape armoured type, served and bedded. Admin. is at 53 Fouad el Awal St, Cairo. Deposit £E.2. B.o.T. (Ref.: ESB 14083/54).*

7 July—New Zealand. Supply of electrical measuring instruments, including 25 ammeters, 30 voltmeters and six meg earth testers, for Stores Div., G.P.O., Windsor Building, 49 Willis St, Wellington. Tender No. P. and T. 150/7014. B.o.T. (Ref.: ESB 13654/54).*

8 July—Belgian Congo. Tenders No. 527/82/62/53 invited for supply, installation, etc. of ground lighting at Elisabethville aerodrome. Specif. from Service des Approvisionments du Ministere des Colonies, 1 rue de la Regence, Brussels, at B.Frs. 700. B.o.T. (Ref.: ESB 13581/54).*

14 July—Australia. State Electricity Commission of Queensland invites tenders (Nos. 450 and 451 respectively) for supply of (a) 3-phase distribution transformers for use on 11 kV system, for Irrigation and Water Supply Commission; and (b) 3-phase and single-phase distribution transformers for Mackay City Council. Separate contracts. Commission is at Scottish Union Hse, Eagle St, Brisbane. B.o.T. (Refs.: ESB 14085/54 and ESB 14099/54 resp.).*

20 July—Greece. Supply and installation of market lighting systems at Larissa, Nea Aukhialos, Elensis and Souda Bay airfields; specifications may be used for marker lighting at Andravida and Thivai. B.o.T. (Ref.: ESB 14066/54).*

21 July—New Zealand. Supply of three miles of telephone cable, enamelled, textile covered, quad, lead sheathed, 202 pairs, 10 lb conductors. (Ref.: P. and T. 150/6946.) Director-General, Stores Div., G.P.O., Wellington.

30 July—Morocco. Supply of four underground 5,500 V cables for Tangier Electricity and Water Board, 4 Rue Vermeer, Tangier. B.o.T. (Ref.: ESB 13655/54).*

31 July—Kuwait. Supply of 25 100 kVAr 415 V 3-phase paper di-electric oil immersed tank type power factor capacitors for phase 2 of 11 kV power distribution system. President, Dept. of Electricity, Govt. of Kuwait.—Advertised in this issue.

2 Aug.—Pakistan. Supply, construction, erection, etc., of a turbo-alternator set with steam raising plant, four boilers and boiler room equipment, switchgear, cables, etc., and spares, for Saidpur power station, Eastern Bengal Railway. Tender No. ENG.X/28029/53. Dept of Supply and Development Govt. of Pakistan, Karachi.

2 Aug.—Tangier. Supply of a motor pump set, 140 m3/h flow under total manometric elevation of 70 metres. L'Ingenieur Directeur de la Regie des Services d'Eau et de l'Electricite, 4 rue Vermeer, Tangier. B.o.T. (Ref.: ESB 14122/54).*

10 Aug.—Portuguese E. Africa. Supply of electrical material for distribution line of Beira Railway general workshop, for Ports, Railways and Transport Dept., Lourenco Marques. Tender No. 90/AB/54. Provisional deposit Esc: 70,000 $00. B.o.T. (Ref.: ESB 13987/54).*

Date not stated—U.S.A. Seattle Lighting Dept. will be inviting tenders (No. B24) for supply of 46 34·5 kV disconnecting switches. B.o.T. (Ref.: ESB 13203/54).*

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 8 June

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	237½	−3½	252
„ (3 months)	236	−2½	—
LEAD, refined pig, min. 99·97% purity (cash)	98½	—	85½
„ (3 months)	95¼	−1¼	81⅜
TIN, refined, min. 99·75% purity (settlement)	724	−1	693½
„ (3 months)	724	+1	691½
ALUMINIUM, ingots 99-99·5%	150	—	161
ZINC, virgin, min. 98% purity (cash)	81½	−⅛	70⅜
„ (3 months)	81½	−⅛	70⅜
RUBBER No 1, RSS. spot (per lb.)	19½d.	+⅜d.	20½d.
„ c.i.f. basis, ports. August (per lb.)	19 5/16d.	+5/16d.	20⅜d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	51	—	50½
Mild Steel Tape (0·014 in.)	40	—	40

Contracts Placed

Leeds T.C. Supply and fixing of electrical equipment at Saxton Lane Ambulance station, Allenby and Stockell Ltd., £1,521.

Dagenham T.C. Electrical installations at C.D. Centre, Utilities (London) Ltd., £1,533.

Newcastle-on-Tyne. Electrical installation at pathological institute and blood transfusion centre at Newcastle General Hospital, Drake and Gorham (Contractors) Ltd., £14,555.

Douglas (I.o.M.) T.C. Supply of 91 tall standards and fittings, Siemens Electric Lamps and Supplies Ltd., £5,342.

Bideford T.C. Supply and erection of equipment for street lighting, British Thomson-Houston Co., Ltd., £1,099.

Maidstone. Installation of improved lighting in county hall, E. Saunders (Margate) Ltd., £1,271.

St. Marylebone B.C. Supply of 642 time switches for replacement of those controlling street lighting units, London Electricity Board, £2,696.

Cork (Eire). Electrical installation at Crawford Municipal Technical Institute, O'Sheas Ltd., £5,538.

Peterborough. Renewal of main cables, etc., at Memorial Hospital, Electrical Installations Ltd., £2,782.

Felling-on-Tyne U.D.C. Supply and erection of sodium lamps to replace gas lighting in Sunderland Rd. General Electric Co., Ltd., £5,622.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Al-Fin. B710,860. Class 7. Specification includes turbine stators, etc. Wellworthy Ltd., Radial Works, Stanford Rd, Lymington, Hants.

Reddi-Wip. B728,163. Class 7. Aerating machines. Bebe Daniels Lyon, 18 Southwick St, W.2.

Greek Pi design. B725,745. Class 9. Electrical and acoustic apparatus, etc. Pye Ltd., Radio Works, St. Andrews Rd, Cambridge.

Haltron in design. 726,335. Class 9. Radio valves. Hall Electric Ltd., 49-55 Lisson Grove, N.W.1.

Saro. 723,488. Class G. Electrical and electronic apparatus etc. Saunders-Roe Ltd., Osborne, East Cowes, Isle of Wight.

Electrofact. 726,730. Class 9. Instruments etc. Electrofact Ltd., Winchester House, Old Broad St, E.C.2.

Lincolnac. 728,918. Class 9. Electrical apparatus etc. J. A. Crabtree and Co. Ltd., Lincoln Works, Lincoln Rd, Walsall, Staffs.

Telelarm. 729,249. Class 9. Burglar alarms. Bonochord Ltd., 48 Welbeck St, W.1.

Servis. B715,767. Class 9. Domestic refrigerators. Wilkins and Mitchell Ltd., Phoenix Works, The Green, Darlaston, Staffs.

Gazette Announcements

COMPANIES ACTS

Midelect Co. Ltd. Resolution for voluntary winding-up passed at meeting on 20 May when T. W. Pell, 187 Wollaton St, Nottingham, was appointed liquidator.

A. P. Crooke and Co. Ltd. At meeting on 5 Feb. resolution was passed for voluntary winding-up. T. A. Moodie of Moodie, Epstein and Partners, 203 Regent St, London W.1, was appointed liquidator

Heat (Advisory and Development) Ltd. E. H. Goddard, Prudential Chambers, Banbury, Oxon, has been appointed liquidator, and creditors are asked to send particulars to him by 21 June.

Hayward Turbine Engineering Co. Ltd. Meeting of members will take place at 12a Maddox St, London W.1, at 11 a.m. on 30 June.

BANKRUPTCY ACTS

First Meetings

Leeds. Samuel Whitton and Leslie Whitton trading together as F. Whitton and Sons at Church Place, Victoria Rd, Leeds. Meeting is taking place today (10 June) at Official Receiver's Office, 29 East Parade Leeds, at 11 a.m. Public examination will be at County Court Hse., Albion Place, Leeds, on 20 July at 10.30 a.m.

Southend. Robert B. Haill, electrical contractor trading at 3 Lord Roberts Ave, Leigh-on-Sea. First meeting is at 11 a.m., today (10 June) at 58-61 York Terrace, Regents' Park, London, N.W.1. Public examination will be at 102 Alexandra Rd, Southend, on 22 July at 11 a.m.

BUSINESS PROSPECTS

Home

Berwick-on-Tweed T.C. Erection of 62 houses at West Field. Borough Surveyor, Municipal Buildings.

Bishop's Stortford. Sketch plans prepared for secondary modern school in Thorley Rd, costing about £173,321.

Blackpool. New Presbyterian church to be built in Plymouth Rd, Fairbrother, Hall and Hedges, of Birley St, are architects.

Bristol. L. H. Dark, 3 Berkeley Sq, is quantity surveyor for erection of eight-storey office block in Baldwin St for Royal London Mutual Insurance Co. Ltd. Also, plans approved for three-storey store at Lennard's Corner for Maple and Co. Ltd., London. Architect is J. Mackintosh, 2 Tyndall's Park Rd, Clifton Rd. Estimated cost £150,000.

Bromsgrove. U.D.C. is to develop an industrial estate at Fringe Green.

Bullingdon (Oxon) R.D.C. Layout approved for erection of 68 houses at Watlington.

Bury St. Edmunds T.C. Plans in hand for erection of 44 houses in Northumberland Ave.

Bushey (Herts). Secondary technical school proposed in Bushey Hall Rd. Estimated cost £248,910.

Caerphilly U.D.C. Erection of 100 houses on Penyrheol estate. A. Rogers, Engineer and Surveyor, Council Offices.

Cambridge. Approval given to erection of new Shire Hall Courts. Architect is Sir W. Holford, 5 Cambridge Terr., London, N.W.1, and cost is estimated at £300,000.

Chester-le-Street. New secondary school may be built at North Lodge.

Chesterfield. Extensions to College of Technology to nine storeys at estimated cost of £110,000 proposed by Derbyshire C.C.

Colchester. Sketch plans approved for £58,760 Monkwick junior school.

Crook (Dur.) U.D.C. Bus station with underground parking places in New Rd is being planned.

Croydon. Plans submitted for factory and offices in Vulcan Way, Addington, for Prototypes (Croydon) Ltd.; and for extension to factory for Nuleaf Ltd., Rosecourt Rd.

Cumberland. County Council proposes £50,000 scheme for area administrative offices at Flatt Walk, Whitehaven. New civic hall to be built by Whitehaven T.C. on corner of Lowther and Scotch Sts. costing about £185,000.

TRADE NOTES

New Sales Office. The Minnesota Mining and Manufacturing Co. Ltd. have opened a sales office at 90 Mitchell St, Glasgow, C.1. (Telephone: City 6704/5).

B.V.C. Under the agreement which the British Vacuum Cleaner and Engineering Co. Ltd. have entered with John Thompson Ltd., for the sale to the latter company of their shares in their subsidiary, B.V.C. Industrial Constructions Ltd., John Thompson Ltd. will, through the subsidiary, control the installations under contracts entered into for fully fixed pneumatic boiler-ash and grit removal plant and hydraulic conveying installations. B.V.C. Industrial Constructions Ltd. will become, under a new name, a subsidiary company of the John Thompson group for undertaking contracts of that plant.

Derbyshire. It is proposed to provide eleven more laboratories at ten grammar schools costing about £55,000.

Doncaster. J. Arthur Rank Organisation is planning the erection of cinema on Hallgate site. Cost estimated at £200,000.

Dundee. Bus depot with workshops, stores, staff accommodation, etc., on Kingsway estate being considered. Cost estimated at £72,000.

Durham. Electricity to be installed soon at Easington New Technical College, Bowburn county school, Edmondsley county school, and Wingate R.C. Aided school.

Glasgow T.C. Erection of 268 houses on Castlemilk unit no. 1 Architectural and Planning Dept., 20 Trongate.

Hatfield (Herts). It is proposed to build secondary modern school costing about £125,187 in Travellers Lane.

Hendon. W. W. Willcocks propose to erect factory in Brent Terrace on N. Circular Rd.

Houghton-le-Spring U.D.C. Revised layout plans approved for Race-course estate comprising 104 houses and two shops.

Hull. Scheme proposed for new £278,000 central police headquarters. City Engineer authorised to carry out completion of new lighting galleries at Ferens Art Gallery at cost of £1,253.

Hyde (Ches). Four-storey factory at Godley is proposed by T. Wall and Sons Ltd.

Kirkintilloch. Dean of Guild Court has approved plans for Protestant primary school at Hillhead, as estimated cost of £50,000.

Leicester. Scraptoft Hall to be bought by education authorities for conversion into Training College. Other buildings to be erected in grounds.

Liverpool. T. M. Alexander and Son, 60 Castle St, are architects for erection of factory at Fazakerley, for Lovell and Christmas Ltd., West Smithfield, London, E.C.1.

Liverpool T.C. Construction of 12 flats in Vauxhall Rd, and 16 in Berwick Sq, City Architect, Blackburn Chambers, Dale St, Kingsway.

Long Eaton U.D.C. Erection of 38 houses and 14 garages on Petersham Rd, estate. F. Turner, Engineer and Surveyor, Town Hall.

Macclesfield. Proposed extensions at county grammar school for girls are estimated to cost £50,000.

Monmouthshire. Construction of secondary modern school at Blackwood. C. L. Jones, County Architect, Queen's Hill, Newport.

Nottingham. Scheme to be prepared for completion of County Hall. It involves £625,000 on new extensions, £185,000 on present building, and £80,000 on the tower.

North Riding. £53,230 to be borrowed for erection of Eastfield primary school No. 3. Permission being sought to include following secondary schools in next year's building programme: Thirsk (£196,000); Stokesley (£196,000); Skelton and Brotton (£143,000); Guisborough (£190,000); Redcar (£140,000); and Wensleydale (£142,000). It is also proposed to include four primary schools in the programme.

North Riding. Stinton, Jones and Partners, 21 Gloucester Place, London, W.1, have been appointed mechanical and electrical consultants for Cleveland Technical College.

Shipley U.D.C. Scheme in hand for rewiring electrical system at Somerset House.

Sodbury (Glos.) R.D.C. Erection of 24 houses at Winterbourne and 6 at Hawkesbury. Surveyor, B. K. Nightingale, Council Offices, Chipping Sodbury, nr. Bristol.

Southend-on-Sea T.C. Extension to be built to Municipal College in London Rd, estimated to cost £175,000. Also, a £225,000 high school for girls in Southchurch Boulevard has been approved.

Southwark. Printing works and offices proposed in Colombo St, by F. J. Daly, 44 Blackfriars Rd, S.E.1, on behalf of Franey and Co., Ltd.

Stowmarket (Suff.). Permission obtained to erect £30,000 primary school in district.

Surbiton (Sur). Wayne Kerr Engineering Co., Ltd., planning to build factory in Roebuck Rd at cost of about £50,000. Architects are L. Manasseh and Partners, 29 Buckingham St, London, W.C.2.

Tring (Herts). Plans in hand for major extensions, costing about £99,247, at Mortimer Hill secondary modern school.

Tynemouth T.C. Erection of 216 dwellings at Chirton Grange North, North Shields. Borough Surveyor, D. M. O'Herlihy, 16 Northumberland Sq, North Shields.

Walton and Weybridge U.D.C. Layout plans approved for construction of 54 flats at Brooklands Way, Weybridge.

Ware (Herts) U.D.C. Licence and loan consent sought for erection of public hall.

Warwickshire. It has been proposed that a new council chamber be built. Cost estimated at £60,000.

West Hartlepool T.C. Forty-eight three-storey flats are to be built in central area.

West Riding. Site purchased in Roberttown Lane, Liversedge, for new secondary modern school. Work expected to start next month.

Whitley Bay. C. Solomon, St Mary's Place, Newcastle, is architect for ice rink for Durham Ice and Sports Stadium Ltd.

Wicklow (Eire). Approval sought for scheme to build county hospital at Rathnew. Cost will be about £135,000.

Willingdon (Sus.). Scheme approved for erection of county secondary school costing about £102,427.

Wimbledon. Reconstruction work to be carried out on ticket offices, booking hall, etc., on District platforms of Wimbledon station.

Overseas

France. Tendering dates are not available at present concerning the supply and installation of ground lighting, valued at about £47,000, and construction of dispersal areas at Luxeuil St Saurent airfield. Interested firms should, however, contact Secretariat d'Etat aux Forces Armees "Air". Service de E'Infrastructure, 24 Boulevard Victor. Paris XVeme, at once.

U.S.A. Combel's Wholesale Hardware and Supply Co., West Howard Ave, Biloxi, Mississippi, would like quotations for electrical appliances. It is a general enquiry and firms should write direct to Mr H. J. Joachim, sales manager.

Quotations are also being sought by London's Inc., P. O. Drawer 799 Huntsville, Alabama, for electric lighting fixtures and appliances. Firms should communicate with Mr D. C. London, President of company.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Telerest Co., Ltd., 19 Avery Row, W.1. Mechanical, electrical and general engineers, etc. Nom. cap.: £1,000. Dirs.: Iris R. Rumbold and Joan M. Roberts.

Oswald Hollman Ltd. Manufacturers of and dealers in electric lamps and shades, electric household and domestic appliances, etc. Nom. cap.: £5,000. Dirs.: O. E. E. Hollman, 86 Kingshall Rd, Beckenham, Kent, and R. K. W. Hollman, 2 Forster Rd, Beckenham, Kent.

Plintsch Bamag Ltd. Distributors, importers and exporters of and dealers in plant and machinery relating to gas production, distribution and conversion, railway equipment, electrical engineering, iron and steel production, etc. Nom. cap.: £100. Dirs.: to be appointed by subscribers. Subs.: Dorothy K. Caulder and Joyce Row, 10 Norfolk St, W.C.2.

Reliance Motor Factors (St. Albans) Ltd., 118 Old London Rd, St. Albans. Dealers in wire cable, manufacturers of and dealers in goods associated with the electrical and engineering trades, etc. Nom. cap.: £4,100. Dirs.: F. H. Eastwood and J. J. Clark.

John Lightfoot Ltd., 195 Upper Richmond Rd, S.W.15. To take over business of electrical engineers carried on at Putney as "John Lightfoot." Nom. cap.: £1,000. Dirs.: J. J. Lightfoot and Florence P. Lightfoot.

E. and A. Perkins (Gosport) Ltd., 29 High St, Gosport, Hants. To take over business of electrical engineers and contractors carried on at Gosport by Edwin and Allan J. Perkins. Nom. cap.: £250. Dirs.: E. Perkins and A. J. Perkins and R. E. Powell.

Gair and Scott Ltd., 32 Brazenose St, Manchester 2. To manufacture and deal in automobile accessories and equipment, including batteries, accumulators, magnetos, dynamos, etc. Nom. cap.: £100. Dirs.: S. Gair and A. Scott.

Alfred Porter (Sales) Ltd., Stella Works, Stanley Rd, Teddington. Distributors of and contractors for cold storage and refrigerating equipment and cooling apparatus, etc. Nom. cap.: £2,000. Dirs.: A. Porter, Marjorie E. Porter, R. J. Totman and J. A. Childs.

Leake Bros. Ltd., 8 Hereford Gdns, Pinner, Mdx. Electrical engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: K. G. Leake and Frances M. Leake.

Stone-Chance Ltd., Lighthouse Works, Smethwick, Birmingham. Manufacturers, constructors, letters on hire, installers, maintainers and repairers of navigational aids and control systems for use in connection with navigation by sea and air, and equipment therefor, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Marian Beadle and Ellen E. Tindell, Austin Friars Hse, Austin Friars, E.C.2.

W. G. Wigginton Ltd., 387 North Circular Rd, Neasden, N.W.10. Electrical engineers and contractors, manufacturers of and dealers in dynamos, motors, etc. Nom. cap.: £1,000. Dirs.: W. G. J. Wigginton (permt. director and chairman), W. H. G. Wigginton and Dorothy K. M. Wigginton.

MEETINGS TO NOTE

THURSDAY, 10 JUNE

INCORP. PLANT ENGINEERS (N. East).—"Planned Maintenance System," T. F. Hutchinson, Roadway Hse, Oxford St, Newcastle, 7 p.m.

FRIDAY, 11 JUNE

I.E.E. (Southern).—Summer meeting at Reading. Luncheon at Grosvenor Hotel, Caversham, 12.30 p.m.

I.E.E. (London Measurements).—Section summer visit.

FRIDAY, 18 JUNE

I.E.E. (London Education).—Exhibition of apparatus, Engineering laboratory of Battersea Polytechnic at 6 p.m.

MONDAY, 21 JUNE

INCORP. PLANT ENGINEERS (Merseyside and N. Wales).—"Economy in Process Steam," H. E. Lake. Radiant Hse, Bold St, Liverpool, 7.15 p.m.

W. T. HENLEY'S TELEGRAPH WORKS

Atlantic Cable Contract Secured

THE seventy-fifth annual general meeting of W. T. Henley's Telegraph Works Co. Ltd., was held on 4 June in London.

Sir John Dalton, A.M.I.E.E., F.C.I.S., chairman of the company, in the course of his speech, said:

The profit from trading stands at £1,228,891, which is a fall of approximately 10% compared with that obtained in 1952. The net profit of £704,000, added to the balance of unappropriated profit brought forward in 1952 of £802,000, gives us the total available of £1,506,000, an increase of 8½% over the total available in the previous year.

We have transferred to General Reserve £400,000, making the amount of the Reserve now £3,500,000. We have paid the dividend on the 4½% Preference Stock, and an interim dividend of 2½% on the Ordinary Stock, and we propose to pay a final dividend of 8% on the Ordinary Stock. Our current assets amount to £8,764,000 and current liabilities to £1,879,000. If this amount is deducted from the current assets, the net current assets amount to £6,885,000 or £273,000 more than the net current assets at the end of the previous year. On the whole, I think you will agree that the balance sheet shows a very strong position and enables us to look to the future with confidence.

Subsidiaries

During 1953 there was an improvement in the position of our subsidiary, Henley's Tyre and Rubber Co. Ltd. This company suffered a considerable setback in 1952 which was experienced by the Tyre trade generally. A substantial recovery was made during 1953 and although our Tyre company is not yet back to the dividend earning stage, the most strenuous efforts are being made to ensure a full recovery of this subsidiary during the current year.

With regard to Henley's (South Africa) Telegraph Works Co. Ltd., our business was well maintained, but the profits obtained on our general business were rather lower than in 1952, due to general conditions in South Africa. The business of our Contract Department in South Africa continues satisfactorily.

The year 1953 was difficult for the Cable Industry. Three factors accounted mainly for the reduced production of the industry as a whole and of your company. Firstly, the nationalised industries—and particularly the electricity supply industry—continued to live on the very large stocks which those industries had built up during the time of scarcity and only recently has there been signs of an improvement on their demands.

Secondly, our principal raw material, copper, was price-controlled up to the beginning of August, 1953. Long notice had been given of the Government's intention to release this control and in consequence cable buyers held up orders in the expectation of a fall in price. Thirdly, a new British Standard for rubber and thermoplastic cables was introduced permitting reduced thicknesses of insulation and sheathing and to sell at lower prices, which, again, induced buyers to live on their stocks and await developments.

Extended Range of Manufacture

Your company had to face up to these difficulties, which were not unforeseen. We extended our range of manufacture so as to offer more comprehensive designs of Super Tension Cables and accessories as well as an improved type of low voltage cable. This low voltage cable is technically a fully impregnated non-draining cable and we are marketing it under the name of "F.I.N.D." Cable. It is already meeting with considerable success. We are also manufacturing and marketing Aluminium Sheathed Cables. Our overseas business amounted to no less than 33⅓% of our turnover, an increase on the previous year. We have, in the face of strenuous competition both from home and overseas, been successful in obtaining many important contracts.

Amongst the important contracts received in the current year, the company has been entrusted with the vital land link of the Atlantic Cable which will cross Newfoundland. In addition, the company recently received a one million dollar contract from the Colombian Government for the Bogota Telephone System.

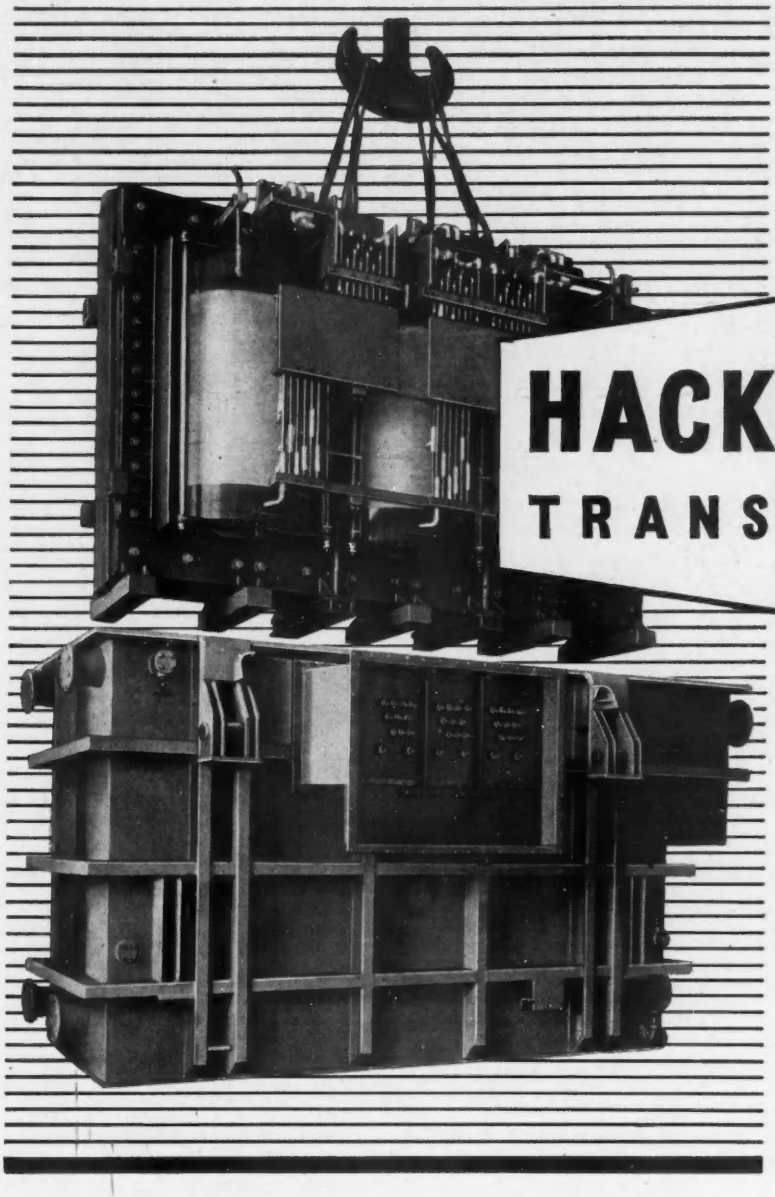
As to the future prospects of your company, your directors have little doubt that they should be favourable. I am pleased to report that the plant in all our factories has been fully maintained.

New plant was installed in all three of our Cable Factories and in our Foundry with the object of improving both quality and productivity. You will have noticed in the notes to your Accounts that we had at the end of 1953 outstanding commitments for capital expenditure of some half a million pounds.

At Gravesend we have, as you know, our engineering factory producing cable accessories, and I am pleased to say our Engineering Department occupies a premier position in the distribution accessory side of the Electrical Industry.

One of the most pleasant features of this Annual Report to Henley Stockholders is to record, once again, the excellent and friendly spirit which prevails amongst all ranks of our large organisation. To a great extent this is due, I feel, to the strong feeling of security amongst our employees.

The report was adopted.



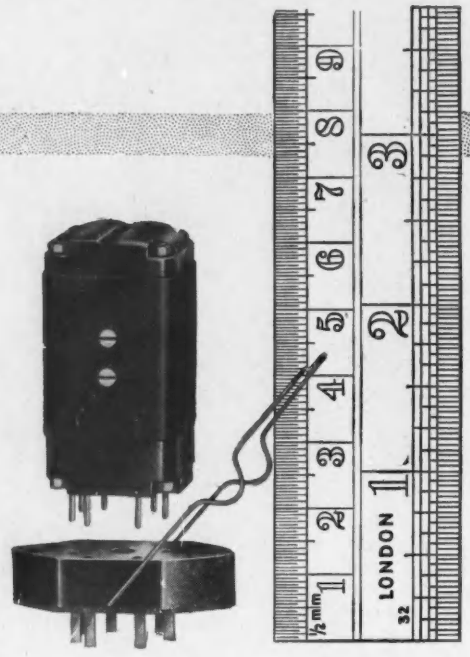
HACKBRIDGE
TRANSFORMERS

Typical 45 MVA Hackbridge transformer 66/33 kV. type ON/OFB, for British Railways.

✻ *There are 20 million kVA of Hackbridge Transformers in World-wide service*

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone : Walton-on-Thames 760 (8 lines) *Telegrams : "Electric, Walton-on-Thames"*

Weston Miniature Moving Coil Relay



The "Weston" Model S.115 Miniature Moving Coil Relay functions as a sensitive "on-off" current switch, and will operate on a power input of only 5 microwatts. Generally the relay is supplied with a centre stable moving contact, but a biased version which affords a single break, or a break followed by a make, is also available. The moving coil can be provided with two windings which offer considerable scope in circuitry. The relay has a seven pin base and is supplied with a separate chassis or panel mounting socket with retaining clip: mounting position is unimportant. Size $1\frac{1}{2}$" x $\frac{3}{4}$" x $2\frac{1}{4}$", weight $1\frac{3}{4}$ oz. only. List No. W.46 gives further particulars and is available on request, but these relays give best service when they are specially designed to suit the circuit in which they are to be used, and we shall be delighted to co-operate on receipt of the pertinent information.

Other WESTON relays

MODEL S54. A relay of extreme sensitivity (size 4-1/5" x 3-1/5"). The high torque developed by the moving system ensures positive contact pressure. Leaflet — List No. W.45 gives details.

MODEL S124. A sensitive relay (size 2-3/16" x 2-3/16") with magnetic hold-on contacts having a higher rating than the other models. Leaflet — List No. W.43 gives details.

SANGAMO WESTON LIMITED

ENFIELD, MIDDLESEX · TEL: ENField 3434 (6 lines) & 1242 (6 lines) GRAMS: SANWEST, ENFIELD

Scottish Factory: Port Glasgow, Renfrewshire. Port Glasgow 41151

Branches: London, CHAncery 4971 Glasgow, Central 6208 · Manchester, Central 7904 · Newcastle-on-Tyne, Newcastle 26867 · Leeds, Leeds 30867 · Liverpool, Central 0230 Wolverhampton, Wolverhampton 21912 · Nottingham, Nottingham 42403 · Bristol, Bristol 21781 · Southampton, Soton 3328 · Brighton, Brighton 28497

VISIT OUR STAND NO. 39 AT THE B.E.P.C. EXHIBITION, EASTBOURNE, JUNE 14-18.

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

EPPING URBAN DISTRICT COUNCIL

INSTALLATION OF ELECTRICITY—PRE-WAR COUNCIL HOUSES

TENDERS are invited for the installation of electricity to approximately 24 Council houses of pre-war construction.

Specifications and Forms of Tender may be obtained on application to the Council's Surveyor, 91 High St, Epping. Drawings and Conditions of Contract may be inspected at this Office.

Tenders in plain sealed envelopes endorsed "Tender for Installation of Electricity—Pre-war Council Houses," bearing no name or mark indicating the sender must be delivered to the undersigned not later than 12 noon on Tuesday, 20 July, 1954.

The Council do not bind themselves to accept the lowest or any tender.

B. HISCOTT,
Clerk to the Council.

Council Offices,
91 High St,
Epping, Essex.

5 June, 1954. (K 163)

COUNTY BOROUGH OF SWANSEA

TENDERS FOR ELECTRICAL INSTALLATION 40 FLATS AT GENDROS, SWANSEA

FIRMS wishing to tender for the Electrical Installation for 40 Flats at Gendros, Swansea, are invited to submit their applications to the Borough Architect, The Guildhall, Swansea, on or before Saturday, 19 June, 1954.

Plans, Specification and Conditions of Contract can be obtained on application and deposit of £2, provided the applicant gives satisfactory evidence of having previously carried out work of a similar character.

The deposit will be refunded after delivery of a bona fide Tender (which is not subsequently withdrawn) and the return of all documents.

No guarantee is given that the lowest or any other Tender will be accepted.

T. B. BOWEN,
Town Clerk.

The Guildhall,
Swansea.
25 May, 1954. (K 64)

CITY OF MANCHESTER

THE Children's Committee invite TENDERS for the Electrical Installation in the Residential Nursery, Longley Lane, Wythenshawe, Manchester. Specification and tender form may be obtained from the City Architect, Town Hall. Deposit £1. 1s. (returnable). Tenders sealed in endorsed envelopes, must be delivered before 10 a.m. 5 July, 1954.

PHILIP B. DINGLE,
Town Clerk.

June 1954. (K 162)

GOVERNMENT OF KUWAIT

THE Government of Kuwait invite TENDERS for the supply F.O.B. Port Country of Origin of twenty-five 100 kVAr, 415 V, three-phase paper di-electric oil immersed tank type Power Factor Capacitors, for Phase II of the 11 kV Power Distribution System in Kuwait. Specifications

continued in next column

continued from previous column

will be available on 26 June, 1954, for the submission of tenders by 31 July, 1954. Specifications must be obtained from the President of the Department of Electricity, Government of Kuwait, Kuwait, Persian Gulf, and will only be available to accredited Kuwaiti Agents. All further copies of the Specification will be issued by the Consulting Engineers in London upon the instruction of the Government of Kuwait. Notice of the foregoing will be posted on the Notice Board of the Department of Electricity, Kuwait, on 19 June, 1954.

Ewbank and Partners Limited,
Engineering Consultants.

10/11 Grosvenor Place,
London, S.W.1. (K 161)

METROPOLITAN BOROUGH OF WANDSWORTH

CABLE

TENDERS are invited for the supply of armoured cable.

Tender documents are obtainable from the Borough Engineer at the undermentioned address and must be delivered to me by noon, 16 June, 1954.

R. H. JERMAN,
Town Clerk.

Municipal Buildings,
Wandsworth, S.W.18. (K 134)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

AIRCRAFT RESEARCH ASSOCIATION LTD.

ELECTRONICS ENGINEER

REQUIRED Electronics Engineer to take charge of a group developing instrumentation for a large transonic tunnel. Candidates should have a sound theoretical and practical knowledge of general electronic work and will be required to develop circuits connected with the automatic recording of data from strain gauge balances and electronic computors for working out results. Applications should be made to the Chief Executive, Aircraft Research Association Ltd., 33, Midland Rd, Bedford, stating age, qualifications and experience. (K 140)

ELECTRICAL AND MECHANICAL ENGINEER

required by BASRAH FORT DIRECTORATE, IRAQ, for one year in first instance. Salary, etc., I.D. 100 rising to I.D. 124 month. (Iraqi dinar=£1). Provident Fund. Free passages. Liberal leave on full salary. Candidates, Graduates of the Institution of Electrical Engineers or equivalent must be experienced in the operation of medium-sized electricity undertakings and in erecting and maintenance of HT and LT overhead and underground systems. A.C. distribution systems and substation plant. Small diesel power station experience would be useful. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30334/EE. (K 112)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.MECH.E. for posts (a) and Corporate Membership for posts (b) an advantage.

(b) MAINTENANCE ENGINEER (MECHANICAL) BRUNSWICK WHARF GENERATING STATION

Vacancy No. 54/428

Wide experience necessary in maintenance of modern generating plant. Duties will include co-ordination of maintenance work and programmes covering the mechanical maintenance of the boiler house, turbine house, coal handling plant, etc. Salary—Class K, Grade 7=£912. 9s. p.a.

(a) JUNIOR ENGINEER
BOW GENERATING STATION

Vacancy No. 54/429

Practical experience of Power Station plant required for general duties in Station. Salary—Class F, Grade 14/3=£491 p.a.

(b) SHIFT CHARGE ENGINEER
DEPTFORD EAST GENERATING STATION

Vacancy No. 54/430

Practical experience in the operation of Power Station plant essential. Character and ability to deal with staff problems necessary. Salary—Class J, Grade 7=£857. 17s. p.a.

(a) SHIFT CHARGE ENGINEER
GROVE ROAD GENERATING STATION

Vacancy No. 54/431

Sound engineering and technical training with practical experience in Generating Station operation. Salary—Class F, Grade 7 =£731. 17s. p.a.

(a) ASSISTANT SHIFT CHARGE ENGINEER
WOOLWICH GENERATING STATION

Vacancy No. 54/432

Sound engineering and technical training necessary with practical experience in the operation of a modern Generating Station, including high pressure plant. Salary—Class G, Grade 9=£673. 1s. p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (K 139)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of FIRST ASSISTANT DISTRICT ENGINEER (Senior Section Engineer), Southport District, No. 1 Sub-Area. Salary N.J.B. Grade E/5 (£740/£774 p.a.).

Applicants should possess sound experience in the Engineering aspects of electricity supply including construction, operation and maintenance of high voltage systems, and preference will be given to those who are Chartered Electrical Engineers.

Appointment superannuable and subject to medical examination.

Application forms obtainable by written request from the Manager, No. 1 Sub-Area, MANWEB, 24 Hatton Gdn, Liverpool 3. Closing date: 24 June, 1954. (K 138)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

ENGINEERING DRAUGHTSMAN (Mechanical) is required in the Generation Construction Department at Wolverhampton. N.J.B. service conditions, superannuable appointment, salary within Schedule "D" of the Agreement, Grade 6, £433/£567 per annum.

A sound technical education and practical training are required, and experience in the drawing office of a large manufacturer's works engaged on turbine, boiler plant, or general engineering construction. Appropriate technical qualifications an advantage.

Apply, quoting Vacancy No. 683MD, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 26 June, 1954. (K 155)

THE SOUTH WEST SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the appointments as FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER in the undernoted Districts:

Clyde Sub-Area—Greenock District.
Lanarkshire Sub-Area—Lanark District.
Lanarkshire Sub-Area—Newlands District.
Lanarkshire Sub-Area—Rutherglen District.
Ayrshire Sub-Area—Ardrossan District.
Ayrshire Sub-Area—Kilmarnock District.
Dumfries and Galloway Sub-Area—Dumfries District.

The posts are on Class E, Grade 6 of the National Joint Board Agreement. Salary scale—£699/£725 per annum.

Applicants should be Engineers with commercial experience and, preferably, should hold an appropriate engineering qualification.

The appointments are superannuable and may be subject to medical examination.

Forms of application, which may be obtained from the applicant's appropriate Officer or the undersigned, should be completed and returned to the undersigned not later than 25 June, 1954. Applicants should indicate the District or Districts applied for.

Persons who have already submitted applications for a similar appointment need only indicate that they wish to be considered for one of the above positions.

J. MEEK,
Secretary.

62, Dalziel Drive,
Glasgow, S.1.
9 June, 1954. (K 113)

SOUTH EAST SCOTLAND ELECTRICITY BOARD
Edinburgh Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER. N.J.B. Grade F.7. Salary £697/£718 p.a. Applicants should have had wide experience in the operation and maintenance of underground distribution systems up to 33 kV.

THIRD ASSISTANT ENGINEER (Planning and Development) N.J.B. Grade J.10, Salary £680/£706. Applicants should have had experience in the planning and estimating of underground networks, and some experience in the design of substations up to 33 kV would be an advantage.

JUNIOR ENGINEERS. N.J.B. Grade J.15 (Salary £501) or J.14 (Salary £545) according to age and experience. The duties will be to assist in the operation and maintenance of underground networks up to 33 kV.

Applications stating age, qualifications, which should be not less than H.N.C. or equivalent, training, experience, and present position, should be received by the undersigned within 14 days.

The above is a re-advertisement of vacancies notified in the Electrical Times on 20 May, 1954, which advertisement is withdrawn. Applications in response to the original advertisement will be considered unless applicants advise otherwise.

G. T. ALLCOCK,
Sub-Area Manager.

Dewar Place,
Edinburgh 3. (K 127)

THE NORTH WESTERN ELECTRICITY BOARD
APPOINTMENT OF DISTRICT ENGINEER
Wigan District

DUTIES will include the control of the District Engineering and Drawing Office Staffs and responsibility for the construction, operation and maintenance of the District distribution systems (overhead and underground). Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £1,002/£1,046 p.a. Grade F.2. N.J.B. Conditions.

Applications to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester 3, by 19 June, 1954.

Note: Persons who applied in response to the previous advertisement for this post need not re-apply. (K 114)

BRITISH ELECTRICITY AUTHORITY
Yorkshire Division

REQUIRE a GENERAL ASSISTANT ENGINEER in the Development Section of the Technical Department, Divisional Headquarters, Leeds.

Salary £501/£694 per annum, Grade 8, Class AX/DX, National Joint Board Agreement.

Applicants should possess technical qualifications leading to Corporate Membership of the Institution of Electrical Engineers and should be capable of carrying out calculations involved in studies on interconnected power systems and preliminary investigation of schemes for system development.

Application forms obtainable from the Divisional Secretary (Establishments), British Electricity House, St. Mary's Rd, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(K 128)

SOUTH EASTERN ELECTRICITY BOARD
ASSISTANT DISTRICT ENGINEER
Dover District

SALARY £561 p.a. under N.J.B. D.9. Superannuable. Applicants should have had experience in the maintenance and operation of three-phase and single-phase E.H.T., H.T. and L.T. Overhead Systems, and indoor and outdoor type substations. Applicants should hold the H.N.C. or its equivalent in electrical engineering.

Applications naming 2 referees to R. G. Widgery, A.M.I.E.E., District Manager, SEE Board, Ladywell, Dover, Kent, by 23 June, 1954.

DEMONSTRATOR
(Female)—Croydon District

Salary £400 by £20—£480 by £10—£490 p.a. plus London Weighting under N.J.C. Grade 1. Superannuable. Preference given to applicants possessing a recognised diploma or certificate in domestic science and the E.A.W. certificate. The person appointed will be required to conduct lectures and demonstrations, advise consumers and generally assist in showrooms.

Applications on forms from H. Lowe, M.I.E.E., District Manager, SEEBoard, Electric House, Wellesley Rd, Croydon, to be returned naming 2 referees by 23 June, 1954.

CARTOGRAPHIC DRAUGHTSMAN
(Male)—Ashford District

Salary £170 p.a. at age 16 to £395 p.a. at 26 rising subject to satisfactory service to £470 p.a. Superannuable. Applicants should have a sound general education and experience of general drawing office routine.

Applications naming 2 referees to D. B. R. Roberts, A.I.E.E., Ashford Manager, SEEBoard, Victoria Rd, Ashford, Kent, by 21 June, 1954.

A. L BURNELL,
Secretary.
(K 136)

BRITISH ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following appointment in the Transmission Department at Divisional Headquarters:

SURVEYOR (TEMPORARY)

Salary N.J.B., Grade 5, Schedule D, £595/£704 per annum.

Duties include levelling, setting out, preparing profiles and plans for overhead lines and substations.

Experience in the use of a theodolite is essential and a knowledge of the interpretation of aerial survey data an advantage.

The commencing salary (which include London Weighting) will depend upon experience and qualifications but will be within the above range.

Forms of application may be obtained from the Authority's Headquarters or from any Divisional Office of the Authority, and should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, by 26 June, 1954.

W. N. C. CLINCH,
Controller.
(K 133)

GOVERNMENT OF KUWAIT

ASSISTANT SHIFT ENGINEER required for service with the Government of Kuwait, Persian Gulf. His services are required for a new Steam Power Station and a Water Distillation Plant. He will be required to work on shift under the Shift Charge Engineers. No applicant will be considered unless he has had shift operating experience with boiler and turbo alternator plant as well as control room experience. The starting consolidated salary offered is at the rate of £1,500 per annum. Free furnished quarters and free medical attention are provided. The first year will be probationary and subject to satisfactory service, this contract may be extended by another two years. Married accommodation cannot be promised under one year. Applications in the first instance, stating qualifications, training and experience, should be addressed to the Personnel Officer, Ewbank and Partners Limited, Engineering Consultants, 10/11 Grosvenor Place, London, S.W.1. (K 71)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division

APPLICATIONS are invited for the appointment of STATION SHIFT CONTROL ENGINEERS at the Ince Power Station, Elton, near Chester. Salary £641/£667 per annum, N.J.B. Class H, Grade 10. Superannuable and subject to medical examination.

Applicants should have had a good general and technical education and experience in the control room of a modern power station. Possession of Higher National Certificate or equivalent qualifications would be an advantage.

Application forms may be obtained from the Divisional Controller, Beaconsfield Rd, Woolton, Liverpool. Closing date: 21 June, 1954. (K 150)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division

VACANCY No. 89/54 — STATION SHIFT CONTROL ENGINEER, Chadderton "A" Generating Station. Salary £555/£569 (E.10).

Vacancy No. 90/54—SHIFT CHARGE ENGINEER, Radcliffe Generating Station. Salary £697/£718 (F.7).

Vacancy No. 91/54—STATION SHIFT CONTROL ENGINEER, Rawtenstall Generating Station. Salary £502/£521 (C.10).

Applications, quoting Vacancy No., to Divisional Controller, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 19 June. (K 116)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

ASSISTANT ENGINEER is required at Hams Hall "B" Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade K12, commencing at £631 per annum.

A sound general education and technical training with experience in a large power station is required. Appropriate technical qualifications an advantage.

Apply quoting Vacancy No. 684MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 26 June, 1954. (K 153)

BRITISH ELECTRICITY AUTHORITY
South Western Division

ASSISTANT ENGINEER (Combustion and Efficiency) required at Hayle Generating Station.

Superannuation Scheme. Salary, N.J.B. Class "F," Grade 7. £697/£718.

Candidates should have had all-round Station experience on boiler and turbine plant, be conversant with instrumentation and automatic combustion control. H.N.C. (Electrical or mechanical) or equivalent an advantage.

Applications on Form A.E./ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 18 June, 1954. (K 147)

CITY OF KIMBERLEY

CITY ELECTRICAL ENGINEER

APPLICATIONS are hereby invited from suitably qualified candidates for the post of City Electrical Engineer on the grade £1,300 x £50—£1,500 per annum plus temporary cost of living allowance at present £222 per annum for married men. In addition there is an allowance for children under the age of eighteen years. The commencing salary will be determined in accordance with the experience and qualifications of the successful candidate.

Applicants must possess a degree in electrical engineering and/or be corporate members of the Institution of Electrical Engineers. The successful applicant will be required to hold or obtain a Certificate of Competency issued by the Government of South Africa. Electricity is purchased in bulk from the Electricity Supply Commission.

The successful applicant will be required to pass a medical examination, to serve a probationary period of six months and upon appointment to the permanent staff will be subject to the Council's Conditions of Service.

Applications marked outwardly "City Electrical Engineer" stating age, marital state, experience and qualifications, the earliest date duty may be assumed and accompanied by copies of not more than three recent testimonials, must be addressed to and reach the undersigned not later than Monday, 28 June, 1954. Further particulars may be obtained from Merz and McLellan, "Milburn," Esher, Surrey.

R. HARTLEY MARRIOTT,
Town Clerk.

Town Office,
Kimberley. (K 151)

MIDLANDS ELECTRICITY BOARD

JUNIOR ENGINEER required in the Shrewsbury District of the Shropshire and Herefordshire Sub-Area. Experience necessary in all branches of Distribution work. Technical qualifications desirable. Salary £423 per annum (N.J.B. Class D, Grade 14 (3).) Superannuable.

Apply, in writing, within 14 days, stating age, experience, present salary and position to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary.

4 June, 1954. (K 152)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

SENIOR CIVIL ENGINEERING DRAUGHTSMAN is required in the Generation Construction Department at Wolverhampton. N.J.B. service conditions, superannuable appointment, salary within Schedule "D" of the Agreement, Grade 5, £567 to £671 per annum.

Applicants should have received a sound practical training and should be experienced in the layout and design of heavy structural steelwork, or of civil engineering and building works for generating stations, including reinforced concrete work. Appropriate qualifications an advantage.

Apply, quoting Vacancy No. 682MD, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 26 June, 1954. (K 154)

SOUTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER

Bristol District

SALARY N.J.B. Class J, Grade 9, £719/£750 per annum.

Successful applicant required to undertake duties in connection with operation, maintenance and construction work in District. All round experience of work on H.V. and L.V. overhead and underground networks and substations, particularly in urban areas, and possession of appropriate technical qualifications desirable.

Applications on forms obtainable from Sub-Area Manager, Electricity House, Colston Ave, Bristol 1, to be returned by 24 June. (K 132)

SOUTHERN ELECTRICITY BOARD

INSTALLATION ASSISTANT

MARLOW Branch, Reading District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grade 11, Column 1 (£573 per annum). N.J.B. Conditions of Service.

Applicants should have sound experience in preparation of specifications and estimates for all types of electrical wiring installations, particularly industrial work. Candidates should be competent to supervise electricians and organise allocation of work.

The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, and returned to him in envelopes suitably endorsed not later than June 25, 1954. (K 115)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the undermentioned vacancies:

Norfolk Sub-Area Headquarters, Norwich

SENIOR ASSISTANT ENGINEER (PLANNING AND DEVELOPMENT)

68/54.R

Candidates should have had a sound technical training and specialised experience in Planning and Development work. They should be corporate members of the Institution of Electrical Engineers or possess similar qualification. The successful candidate will be required to exercise certain supervision over the other sections in the Engineering Department.

Salary in accordance with Class J, Grade 3, of the National Joint Board Salary Agreement commencing £1,104.

Apply to the Manager, Norfolk Sub-Area, Eastern Electricity Board, Duke St, Norwich, Norfolk.

Essex Sub-Area Headquarters, Brentwood

SENIOR ASSISTANT ENGINEER (OPERATION AND MAINTENANCE)

73/54.R

Candidates should be corporate members of the Institution of Electrical Engineers and must have had considerable experience in the maintenance and control of large overhead and underground systems and substations up to and including 33 kV. Duties include the supervision of a Sub-Area System Control Centre.

Salary will be in accordance with Class K, Grade 4, of the National Joint Board Salary Agreement commencing at £1,093 plus London Weighting.

Apply to the Manager, Essex Sub-Area, Eastern Electricity Board, Millfield, Bentley, Nr. Brentwood, Essex.

DRAUGHTSMEN

49/54.N

SENIOR DRAUGHTSMAN—Candidates should have had a good technical training with knowledge of drawing office practice and the supervision of draughtsmen. They should be experienced in the design, layout and detailing of indoor and outdoor substations and of transmission systems at voltages up to and including 33 kV. Knowledge of reinforced concrete and steel structures is essential.

Salary—National Joint Board, Schedule "D," Grade 5, £567/£671, plus London Weighting.

ENGINEERING DRAUGHTSMAN (Architectural)—Candidates should have had a good technical training and experience in the preparation of plans and detailed drawings of buildings and civil engineering works including substations, service centres, offices and workshops.

Salary—National Joint Board, Schedule "D," Grade 6, £433/£567, plus London Weighting.

ENGINEERING DRAUGHTSMAN (Electrical)—Candidates should have had a good technical training and experience in the design and construction of substation buildings and the layout of equipment, the preparation of electrical diagrams, 33 kV records and associated work.

Salary—National Joint Board, Schedule "D," Grade 6, £433/£567, plus London Weighting.

continued in next column

continued from previous column

DRAUGHTSMAN—Candidates for this post should have had a good general education and experience in the preparation and maintenance of H.V. and L.V. mains records and associated work.

Salary—National Joint Council, Grade 1, £400/£490, plus London Weighting.

TWO JUNIOR DRAUGHTSMEN—Candidates should have had a good general education and some experience of general drawing office duties including photographic and print room work.

Salary—National Joint Council, General Clerical Grade, commencing at £170 at age 16 and rising to £470, plus London Weighting.

Apply to the Manager, Essex Sub-Area, Eastern Electricity Board, Millfield, Bentley, Nr. Brentwood, Essex.

Northmet Sub-Area

Hendon District

DISTRICT COMMERCIAL ENGINEER

70/54.R

The successful candidate will be responsible under the District Manager for all commercial activities. Preference will be given to corporate members of the Institution of Electrical Engineers who possess the following qualifications:

1. Sound engineering training.
2. Experience in commercial development, including rates of supply.
3. Experience in hire and hire purchase schemes, control of Service Centre sales and maintenance staff.
4. Preparation of wiring specifications and control of wiring staff.

Salary in accordance with Class F, Grade 4, of the National Joint Board Salary Agreement commencing at £850, plus London Weighting.

Apply to the District Manager, Hendon, Eastern Electricity Board, 137/9 Brent St, Hendon, London, N.W.4.

St. Albans and Welwyn Garden City District

GENERAL ASSISTANT ENGINEER

69/54.R

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems.

Salary in accordance with Class F, Grade 11, of the National Joint Board Salary Agreement commencing at £548.

Apply to the District Manager, Eastern Electricity Board, 107 St. Peter's St, St. Albans, Herts.

Future salary and conditions of service for all these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience with details of present appointment and salary, should be submitted to the Manager concerned within fourteen days of the appearance of this advertisement. (K 129)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

PRINCIPAL ASSISTANT (Sales) required in the No. 4/5 Sub-Area of the Board, based on Sub-Area Headquarters, Electricity House, Rhostyllen, near Wrexham. Salary £730/£805 per annum (N.J.C. Grade 6).

The duties include the supervision of sales of appliances in Service Centres, the organisation and layout of exhibitions and agricultural shows, and lecturing and demonstrating to staff and local organisations. Applicants should preferably have commercial experience in the Electricity Supply Industry, and should possess the ability to design window displays and be able to drive a motor car.

Appointment superannuable and subject to medical examination.

Application forms obtainable from the Manager, No. 4/5 Sub-Area, MANWEB, Electricity House, Rhostyllen, near Wrexham, Denbighshire. Closing date: 23 June, 1954. (K 137)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited from suitably qualified engineers for the following position:

SHIFT CONTROL ENGINEER, LONGFORD POWER STATION, COVENTRY
Vacancy No. 85/54/ET

Applicants should have had a sound training and practical experience in a modern Power Station. The possession of technical qualifications is desirable.

Salary will be in accordance with Class G, Grade 10 (£608/£630 per annum) of the National Joint Board Agreement.

The appointment will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Closing date for receipt of applications: 28 June, 1954.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy No.

L. F. JEFFREY,
Divisional Controller.
(K 149)

AIR MINISTRY require MECHANICAL AND ELECTRICAL ENGINEERS in Works Department for design, operation and maintenance of mechanical and electrical services on R.A.F. stations at home and overseas and Civil Aviation stations. Appointments in two grades (a) Main Grade, salary scale £1,000 to £1,320 (b) Assistant Grade £650 to £1,000. Starting pay according to qualifications and experience. Salaries somewhat lower in provinces. Candidates should be age 25 or over. Appointments temporary and non-pensionable but with long term possibilities. Special allowance up to £1,500 a year according to location payable in addition to salary during overseas service. Candidates must be natural born British subjects of natural born British parents.

Minimum qualifications and experience for both grades of posts:

(i) (a) University degree or equivalent diploma in electrical and/or mechanical engineering and at least a two year apprenticeship or (b) Graduate or Corporate Membership of the Institutions of Mechanical or Electrical Engineers with appreciable electrical engineering experience and at least three years' apprenticeship and (ii) employment in responsible position for minimum of three years with well established engineering concern providing wide experience in electrical and mechanical engineering practice.

Application forms quoting reference D1/54A from M.L. and N.S. Technical and Scientific Register (K), Almack House, 26 King St, London, S.W.1. (K 126)

A LARGE industrial undertaking in the North Western area, with world-wide associations, invites applications from Honours Graduates in ELECTRICAL ENGINEERING who have completed full-time National Service obligations to fill a vacancy in a central technical department. The upper age limit for the post is 28. Previous industrial experience, although desirable, is not essential. The successful candidate will be trained in matters relating to the manufacture, design, development and application of the Company's products and will also be given an opportunity of familiarising himself with relevant matters connected with the Commercial and Sales side of the organisation. The initial training and subsequent experience will be designed to give the candidate every opportunity of advancement to an executive post. The commencing salary will be within the range £600 to £750 p.a., dependent upon the qualifications and experience of the candidate appointed. A non-contributory pension scheme is operated by the Company. Please write, giving full particulars, which will be treated in strictest confidence, to—Box No. 3591, Electrical Times. (K 122)

BRITISH Engine Boiler and Electrical Insurance Co., Ltd., 24 Fennel St, Manchester 4. The Company requires additional ELECTRICAL PLANT INSPECTORS in various districts. Permanent positions carrying progressive salary scale £540 to £785 and non-contributory pension. Candidates age 26 to 30 years with apprenticeship in the manufacture or repair of electrical machinery and preferably with subsequent experience of industrial use of electrical machinery and who have gained the Higher National Certificate in Electrical Engineering or are Graduates of the Institution of Electrical Engineers are invited to apply in own handwriting stating age, qualifications and experience. (K 103)

DRAUGHTSMAN required as assistant to Design Engineer. This is a unique opportunity for a keen young man with experience in the design and detail of electro-mechanical devices. Applicants must be willing to undertake all duties connected with a Drawing Office, and should be of at least O.N.C. standard. Five-day week, canteen facilities, paid holiday this year. Salary £500/£650 per annum, depending upon experience. Company situated 20 miles north of London. Our staff have been advised of this appointment. Write giving full details to—Box No. 3597, Electrical Times. (K 142)

ELECTRICAL DRAUGHTSMAN, age 22 to 26, required by Consulting Engineers in London, for design of power and lighting installations and distribution schemes. Minimum qualification Higher National Certificate. Some previous experience desirable. Apply, stating age, qualifications, experience and present salary to Rendel, Palmer and Tritton, 125 Victoria St, London, S.W.1. (K 119)

ELECTRICAL ENGINEER/DRAUGHTSMAN, age 26 to 30, required by Consulting Engineers in London for design of power and lighting installations and distribution schemes, preparation of estimates and specifications.

Minimum qualification Higher National Certificate.

Previous experience essential; preference given to men with contracting experience.

Apply stating age, qualifications, experience and present salary to Rendel, Palmer and Tritton, 125 Victoria St, London, S.W.1. (K 120)

ELECTRICAL ENGINEER, under 35 years, as Technical Representative and Consultant. A.M.I.E.E. or equivalent. Must have practical experience of wiring layouts for multi-storey buildings. Based on Merseyside. State full particulars, experience, salary required.—Box No. 3593, Electrical Times. (K 123)

ELECTRICAL DRAUGHTSMEN for design of lighting, power and instrument installations for chemical and oil refinery plants. Applicants should be experienced in the preparation of bills of material from design drawings. Salaries above average, five-day week, generous staff pension scheme. Write stating age, experience, and qualifications to Head Wrightson Processes Ltd., 24 Baltic St, London, E.C.1. (K 22)

ELECTRICAL DESIGNERS AND DRAUGHTSMEN required permanently. Experience in lighting and power. Installations for Schools, Hospitals, and other large Institutions. Five day week. Excellent prospects. Interview expenses refunded. Confidential applications to E. G. Phillips Son and Norfolk, Consulting Engineers, Arskus House, Annesley Grove, Nottingham. (K 156)

JUNIOR AND SENIOR DETAIL DRAUGHTSMEN with shop experience and design knowledge for work on light steel structures in London. 5 day week. Pension Fund. Apply in writing stating age, experience, qualifications and salary required to Staff Officer, British Insulated Callender's Construction Company Limited, 30 Leicester Sq, London, W.C.2. (K 141)

Transformers (Watford) Limited. wish to make a Senior Sales appointment.

Applicants should be well known in the industry and have held a responsible position in a similar capacity.

Excellent prospects and remuneration.

Apply in confidence to Managing Director, Transformers (Watford) Limited, Sandown Road, Watford, Herts. (K 99p)

JOHNSON and Phillips Limited have vacancies in their CABLE ESTIMATING DEPARTMENT, preference will be given to men experienced in preparation of estimates of cost of rubber insulated cables and flexibles also thermosplastic cables. Applications giving age, experience and salary expected should be addressed to Employment Manager, Messrs Johnson and Phillips Limited, Victoria Way, Charlton, London, S.E.7. (K 135)

LARGE Oil Company requires two ELECTRICAL ENGINEERS for construction and maintenance work in Middle East. Must have O.N.C. or City and Guilds and have served full apprenticeship with reputable British firm, followed by some years' practical industrial experience. Refinery experience an advantage. Desirably aged 26 to 30 with absolute limit 35. Pensionable posts with generous allowances in addition to salary. Paid home leave. Married applicants must be prepared for 2 years separation. Write, giving details and quoting No. 456 to Box No. 7716, c/o Charles Barker and Sons Ltd., 31 Budge Row, London, E.C.4. (K 118)

LEADING Domestic Appliance Manufacturer requires a SALES EXECUTIVE, not more than 40 years of age, resident in Devon.

Qualifications: Good education and appearance. Able to drive. Previous sales experience and good administrative ability. Substantial basic salary, commission and expenses. Full details to—Box No. 3599, Electrical Times. (K 143)

MANAGER for Electrical Repair and Maintenance organisation in N.E. Lancashire. Applicant must have Repair Shop experience and be capable of handling maintenance contract work.—Box No. 3589, Electrical Times. (K 121)

PRODUCTION ENGINEERS. The Igranic Electric Company Ltd. is proposing to engage two young professional electrical or mechanical engineers who will be given special opportunities to prepare them for executive appointments in works management. Applicants should be under 30 years of age and have completed their National Service and either a Graduate or Student Apprenticeship. Good starting salary will be paid and the prospects for advancement are most favourable. Reply giving full particulars of age, education, training and experience to Works Director, Igranic Electric Co., Ltd., Bedford. (K 158)

REPRESENTATIVE to cover S.E. Scotland Electricity Board and N. of Scotland Hydro-Electric Board areas. Applicants should be resident on the territory, have good contacts with architects, wholesalers and contractors, and possess their own car. This is an interesting and worthwhile post for a man with right background. Write in confidence to—The Sales Manager. M.K. Electric Limited, Wakefield St, London, N.18. (K 63)

REPRESENTATIVE required by well-known "Non-Ring" Cable Manufacturer to cover Lancashire, Cheshire and North Wales. Applicants must have contacts with Area Boards, National Coal Board and Industrial organisations, etc. Reply stating full details experience and salary required—Box No. 3603, Electrical Times. (K 145)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.

HIGH VOLTAGE INSULATION ENGINEER

THE ENGLISH ELECTRIC CO., LTD., at Stafford have a vacancy for an ENGINEER, preferably with post-graduate experience in high-voltage engineering, to undertake investigations and development work in high voltage insulation. Applications should be submitted to the Chief Insulation Engineer, Dept. C.P.S., 336/7, Strand, W.C.2, quoting Ref. 1329. (K 124p)

REPRESENTATIVE needed by Electrical Appliance Manufacturer to cover South West England and South Wales. Applicants, who must be car owners, should live either in Bristol or Cardiff. Experience of selling to the Wholesale Electrical Trade, Electricity Boards and Local Authorities an advantage. Remuneration by Salary and Commission. Apply in confidence (fullest details please) to—Box No. 3601, Electrical Times. (K 144)

SALES ENGINEER required by Mersey Cable Works Ltd., Linacre Lane, Bootle, Liverpool, 20, for the South London and Southern Counties area.

Applicants, who should be between 35/45, will be required to reside in the above area.

Previous experience in the Electric Cable Industry is desirable, preferably with rubber and thermoplastic cables.

Salary will be in accordance with experience and qualifications and the appointment qualifies for the Tube Investments Pension Scheme.

Applications in writing should be addressed to the Secretary. (K 117)

SENIOR ELECTRICAL DRAUGHTSMAN required for research and development work at Havering, Romford. Sound experience in power wiring and layouts essential. Application in writing, giving full personal details to Ilford Limited, Romford, Essex. (K 96)

TECHNICAL ASSISTANT required for small firm of electrical heating manufacturers in Woodford.

Applicants should have the Ordinary National Certificate in Electrical Engineering and should preferably have completed their National Service.

Write, giving full particulars of experience, qualifications, present salary and earliest starting date to—Box No. 3569, Electrical Times. (K 49)

THE ENGLISH ELECTRIC CO., LTD., Stafford, invites applications from YOUNG ENGINEERS having practical or theoretical knowledge of servo-mechanisms analysis, for interesting work in their Special Engineering Section. Preference will be given to those possessing an engineering degree but applicants with H.N.C. will be considered, if they are strong on mathematics. Please write giving full details and quoting Ref. 1328 to Dept. C.P.S., 336/7 Strand, W.C.2. (K 125)

APPOINTMENTS WANTED

ELECTRICAL ENGINEER with Consulting Engineering experience seeks appointments. Inspections, Reports and recommendations, site supervision, etc. Fees reasonable.—Box No. 3563, Electrical Times. (K 35)

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12 and 15 h.p., 3-ph., 400 V, A.C., 50 c., 900/1,200 r.p.m. Motors wanted. Green Bros. (Electrical) Ltd., Brackley, Northants. (K 38)

SURPLUS Electrical Stocks bought for cash.—Box No. 3567, Electrical Times. (K 39)

WANTED, D.C. and A.C. ball-bearing MOTORS, motor generator sets, dynamos and alternators.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London, N.1. (K 3)

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FISHER FOUNDRIES LTD., Greet, Birmingham 11, for Machine Moulded Precision Castings in gun metal and soft grey iron. Tel.: Victoria 0197. (K 18)

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1—600 kVA British Polar/ASEA Diesel Alternator Set, c/w starting equipment comprising Lister 27 h.p. Diesel Engine coupled to ASEA Type GA.22 18 kVA Generator with Exciter and ASEA 3·5 h.p., 925 r.p.m. Electric Motor coupled to Hamworthy Air Compressor.

2—ASEA 100 h.p. 1,450 r.p.m. 400/3/50 Electric Motors c/w oil immersed Stator Switches and Rotor Starters.

2—ASEA Reduction Gears, 1,450-490 r.p.m.

1—ASEA 46 h.p., 1,450 r.p.m. 400/3/50 Electric Motors c/w oil immersed Rotor Starter (recently overhauled).

1—D. and M. 33 kVA 400-440/3/50 750 r.p.m. Dynamo driven by 45 h.p. "Atlas" Polar Diesel Engine c/w Control Panel.

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Full particulars may be obtained and inspection arranged on application to London Brick Company Limited, Africa House, Kingsway, W.C.2. (K 130)

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. Specification 214 or individual requirements. — Blickvac, 505 Lordship Lane, S.E.22. Tel: Forest Hill 7089. (K 14)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (K 6)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Rd, East Dulwich, S.E.22 (Forest Hill 2278-9). (K 2)

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HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (K 7)

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THREE Johnson and Phillips 65 kVA Oil-Cooled Welding Transformers.—Box No. 3535, Electrical Times. (K 41)

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INDEX TO ADVERTISERS

Aidas Electric Ltd. 55
Allied Ironfounders Ltd. 2
Alton Battery Co. Ltd. 23
Automatic Coil Winder & Electrical Equipment Co. Ltd. 16

Bakelite Ltd. 36
Banner Electric Co. Ltd. 82
Belmos Co. Ltd. 45
Bill Switchgear Ltd. 3
Brayhead Springs Ltd. 82
British Driver-Harris Co. Ltd.... ... 56
British Electric Resistance Co. Ltd. ... 38
British Electrical Repairs Ltd. 9
British Insulated Callender's Cables Ltd. 41
British National Electrics Ltd. ... 28, 29
British Power Transformer Co. Ltd. ... 4
British Thomson-Houston Co. Ltd. ... 43
Brook Motors Ltd. 14
Brush Electrical Engineering Co. Ltd. 35, 76
Burco Ltd. 44, 58
Burn, George, Ltd. 6

Cable Makers Association 50
Cayson Electrics Ltd. 78
Channel Conduits Ltd. 42
Clyde Blowers Ltd. 86
Commercial Resistor Mfg. Co. Ltd. ... 32
Connollys (Blackley) Ltd. 80
Copper Development Association ... 71
Counting Instruments Ltd. 10

"Diamond H" Switches Ltd. 58
Drake & Gorham Wholesale Ltd. ... 74
D.S. Plugs Ltd. 86

Edison Swan Electric Co. Ltd.... ... 17
Electric Construction Co. Ltd.... ... 54
Electrical Remote Control Co., Ltd. ... 78
Electrical Times Ltd. 78
Electro Dynamic Construction Co. Ltd. 88
Ellison, George, Ltd. 53
English Electric Co., Ltd. ... 1, 73
Erskine Heap & Co. Ltd. 30
Evershed & Vignoles Ltd. 37

Ferranti Ltd. 7
Finlayson, Bousfield & Co., Ltd. ... 72
Fry's Metal Foundries Ltd. 81

General Cable Manufacturing Co. Ltd. 24
General Electric Co. Ltd. ... 31, 33, 75
Grey & Marten Ltd. 70
Griffiths Bros. & Co. London Ltd. ... 55

Hackbridge & Hewittic Electric Co., Ltd. 61
Hague & McKenzie Ltd. 5
Harris, John, Tools Ltd. 6
Heatrae Ltd. 22
Henley's, W. T., Telegraph Works Co. Ltd. ... ... 70, *Cover* (i)
Hercules Powder Co., Ltd. 46
Howells (Electric Motors) Ltd. ... 74

Igranic Electric Co. Ltd. 51
International Combustion Ltd.... ... 21

Johnson & Phillips Ltd. 77

Kent Bros. Electric Wire Co. & E. H. Phillips Ltd. 78

Legg (Industries) Ltd. 26

Marine Engineering Co. (Stockport) Ltd. 84
Martindale Electric Co. Ltd. 84
McGeoch, Wm., & Co., Ltd. 38
McKechnie Brothers Ltd. 42
Meritus (Barnet) Ltd. 84
Metafiltration Co. Ltd. 26
Metallic Seamless Tube Co. Ltd. ... 72
Metropolitan Electric Cable & Construction Co. Ltd. 27
Metropolitan - Vickers Electrical Co. Ltd. 49, 57
Micanite & Insulators Co. Ltd. *Cover* (ii)
Midland Electric Manufacturing Co. Ltd. 69
M.K. Electric Ltd. 47
Nalder Bros. & Thompson Ltd. ... 60
Nettle Accessories Ltd.... 10
Nevelin Electric Co. Ltd. 40
Newton Bros. (Derby) Ltd. 82

Oddie, Bradbury & Cull Ltd. 70
Ottermill Switchgear Ltd. (formerly G.M. Eng. (Ottery St. Mary) Ltd.) ... 52

Partridge, Wilson & Co. Ltd. 87
Pritchett & Gold and E.P.S. Co. Ltd. ... 83

Ransome & Marles Bearing Co., Ltd. ... 25
Resinoid & Mica Products Ltd.... ... 78
Revo Electric Co. Ltd. 12
Richardsons Westgarth (Hartlepool) Ltd. 32

Salter, Geo., & Co. Ltd. 85
Sanders, Wm., & Co. (Wednesbury) Ltd. 13
Sangamo Weston Ltd. 62
Scottish Cables Ltd. ... ... *Cover* (iv)
Senior Economisers Ltd. ... *Cover* (iii)
Shankland, G. A., Ltd. 84
Siemens Electric Lamps & Supplies Ltd. 11, 59
Simon-Carves Ltd. 19
Smart & Brown (Engineers) Ltd. ... 15
South Wales Switchgear Ltd. ... 20, 68
Sperryn & Co., Ltd. 76
Stanhope Box Co., Ltd. 80
Statter, J. G., & Co. Ltd. 82

Taylor Tunnicliff Ltd. 34
Transformer & Electrical Co. Ltd. ... 80
Trumeter Co. Ltd. 80
Tucker, J. H., & Co. Ltd. 18

Universal Boilers & Engineering Co. Ltd. 18

Westinghouse Brake & Signal Co. Ltd. 39
Wiggin, Henry, & Co. Ltd. 8
Wilcox, Edward, & Co. Ltd. 48
Wootton & Co., Ltd. 4

Yorkshire Switchgear & Eng. Co. Ltd.... 79

Zenith Electric Co. Ltd. 48

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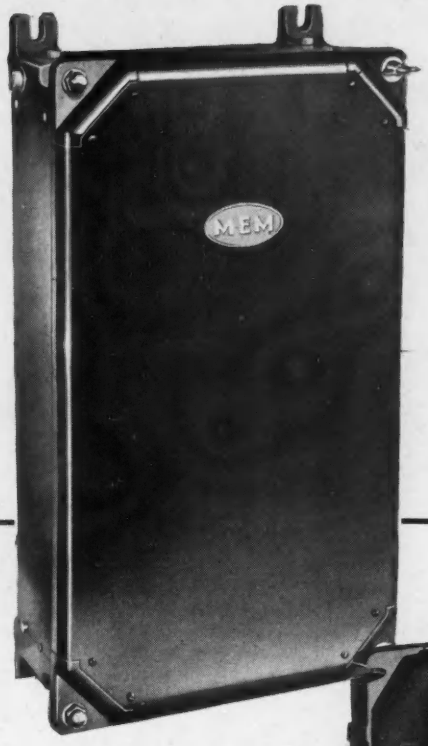

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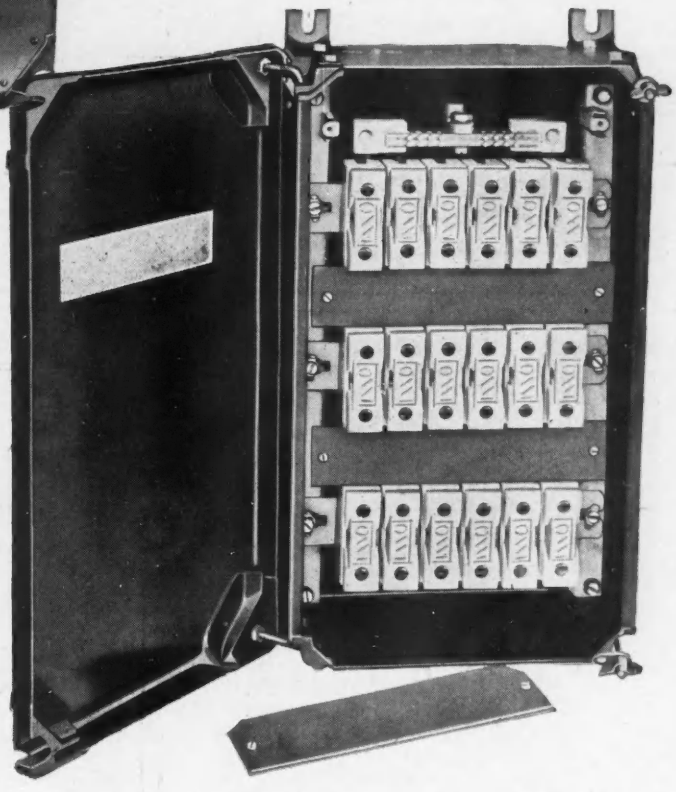

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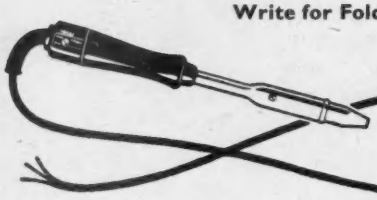

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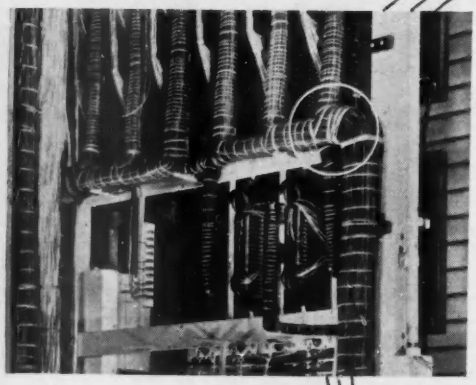

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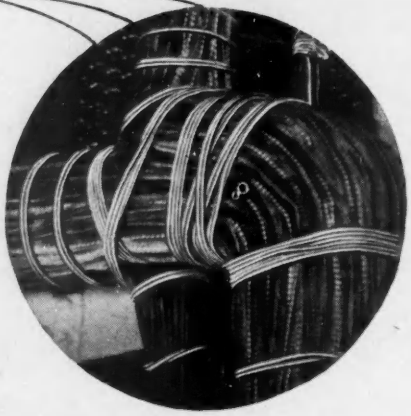

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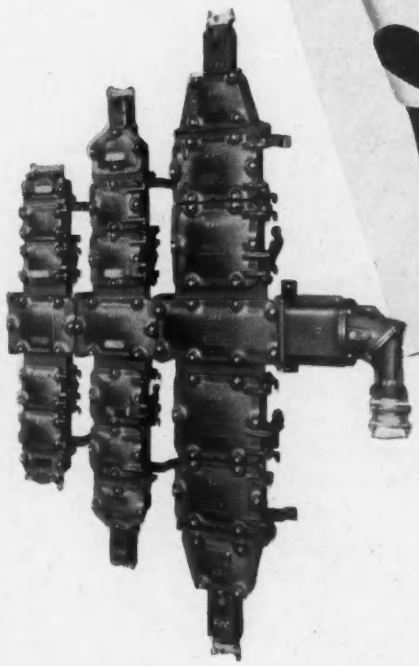

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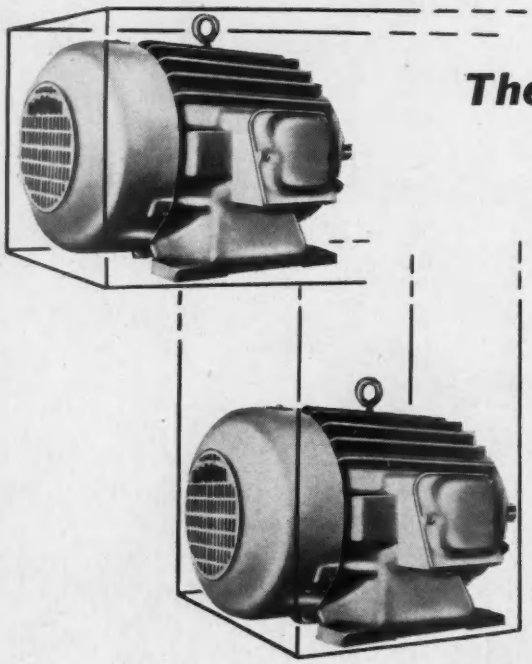

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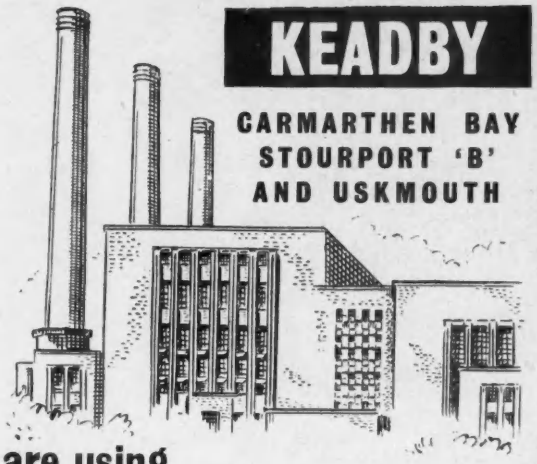

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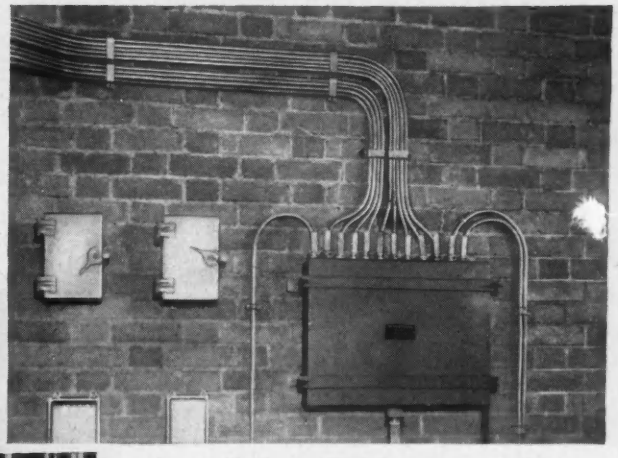

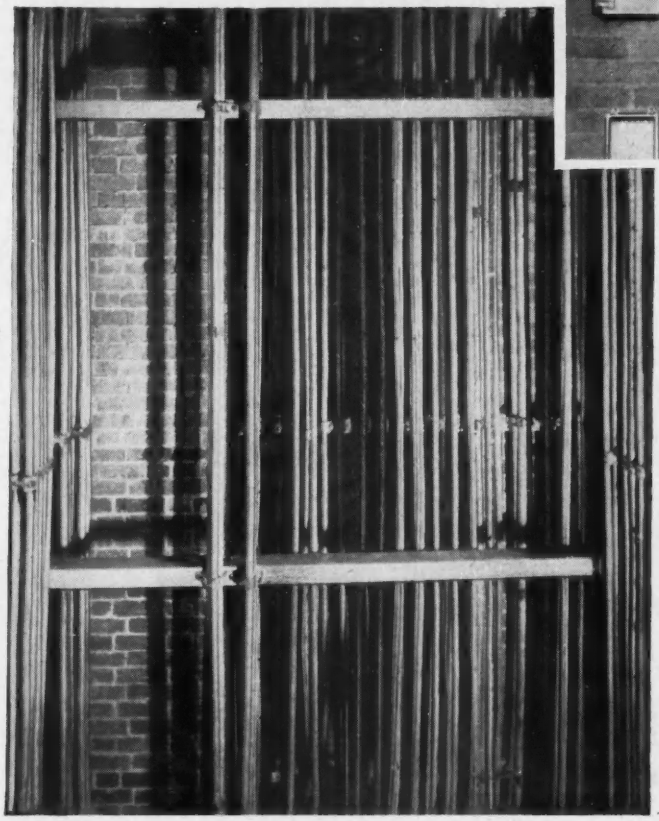

Above: Neatly installed formations of aluminium sheathed wiring cables terminating in a marshalling box.

Left: A main cable trunk at Keadby comprising 150 h.v. and l.v. cables, all but a few being aluminium sheathed.

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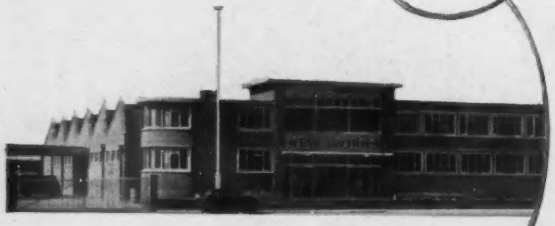

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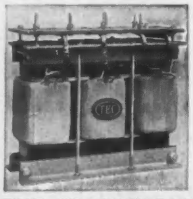

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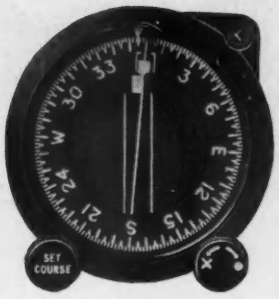

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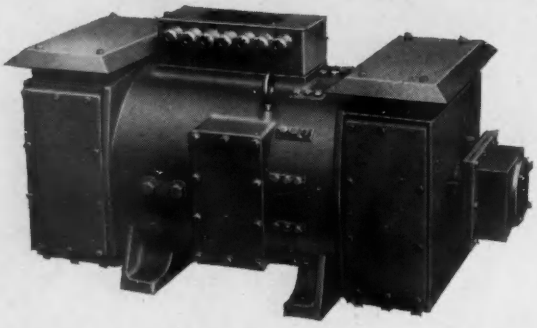

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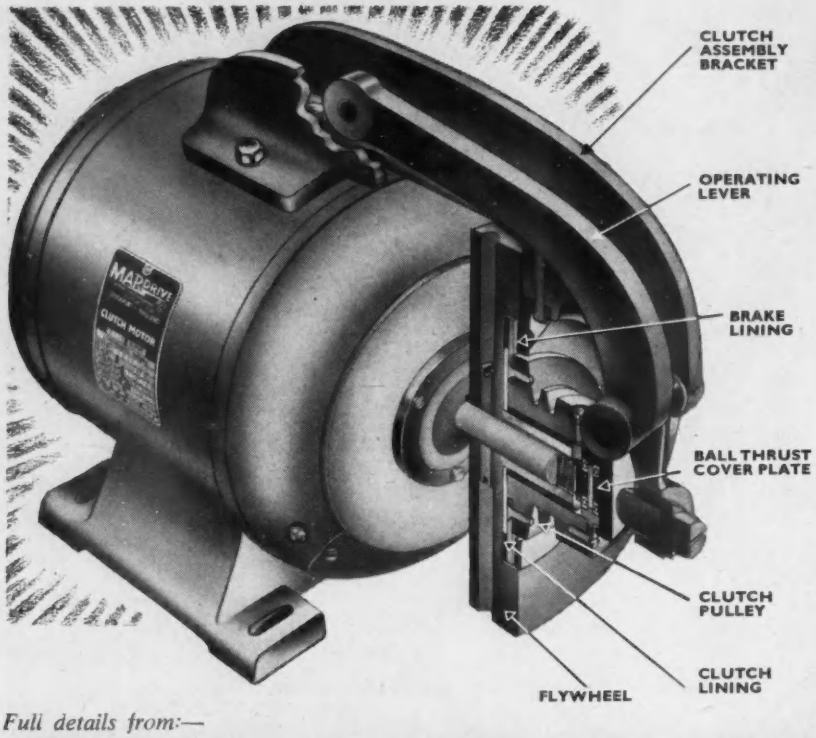

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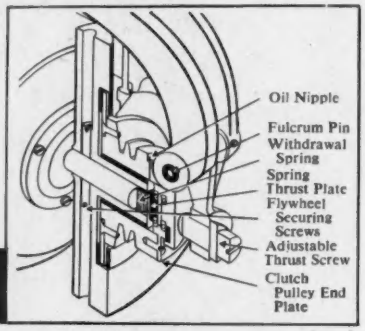

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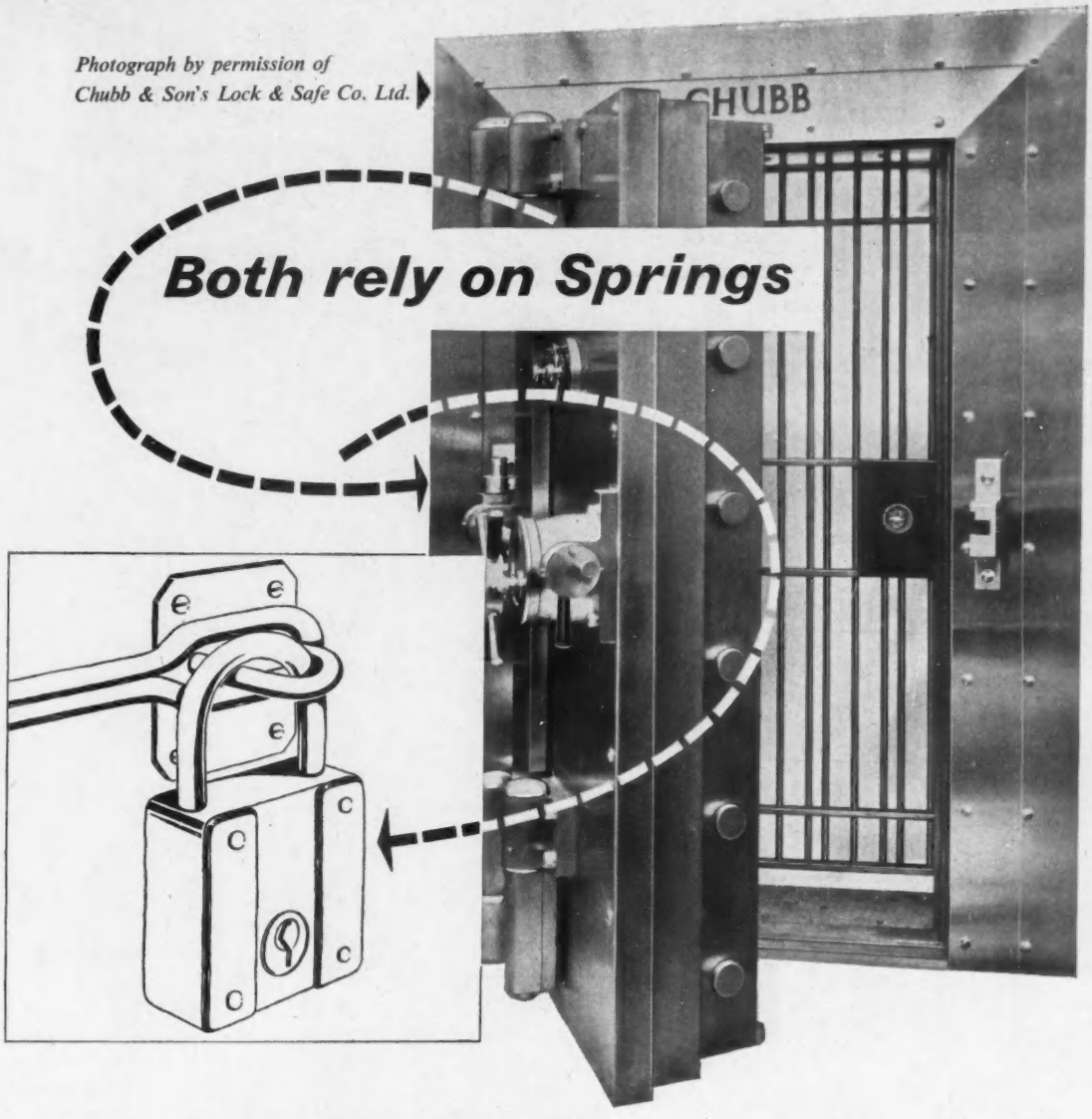

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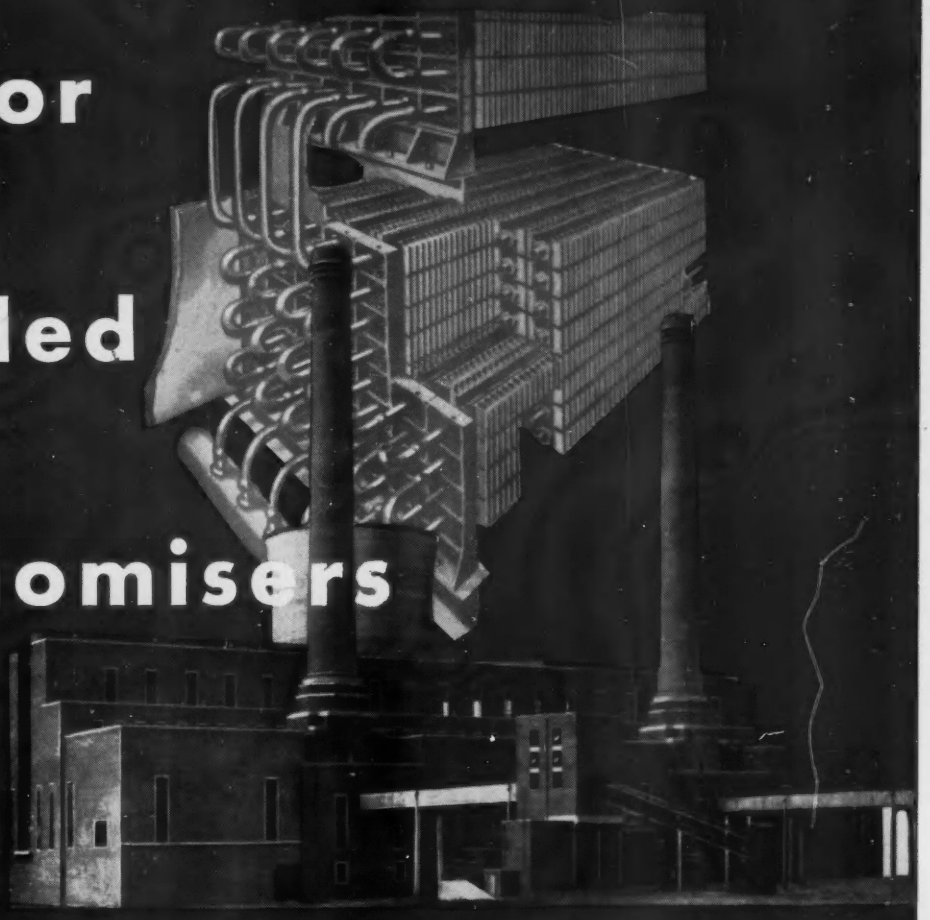

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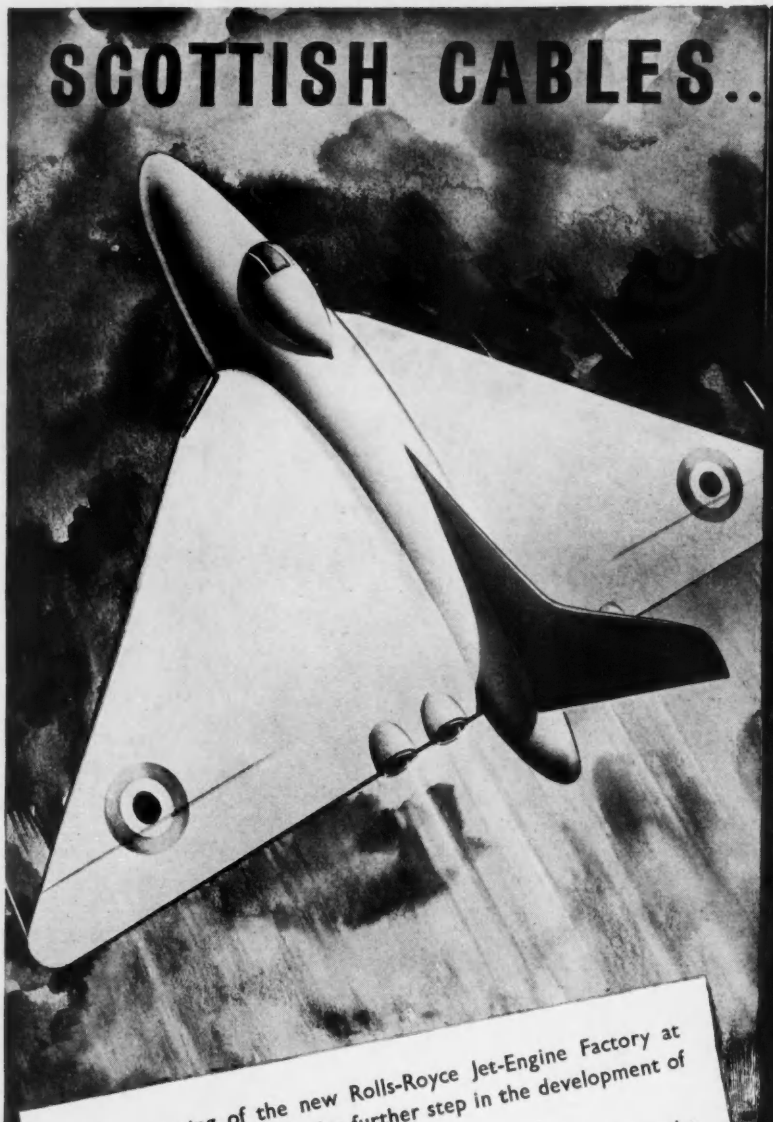

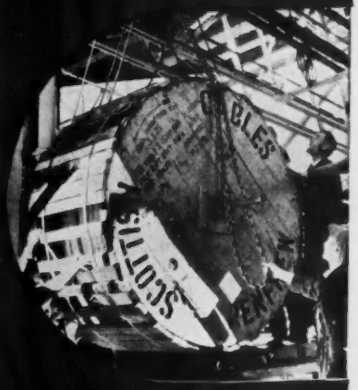

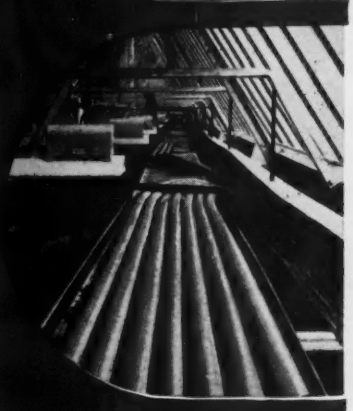

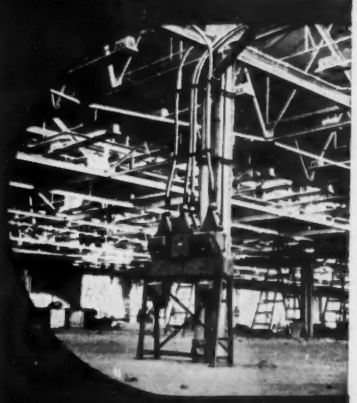

THE opening of the new Rolls-Royce Jet-Engine Factory at East Kilbride marked a further step in the development of British Aero-Engine Production.

The large quantities of E.H.T. and L.T. Cable required for the extensive Electrical System throughout the Factory were manufactured and supplied by Scottish Cables Limited, and installed by James Kilpatrick & Son, Ltd., Paisley.

The accompanying photographs were taken during the erection of the Factory with the kind co-operation of Rolls-Royce Ltd.

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